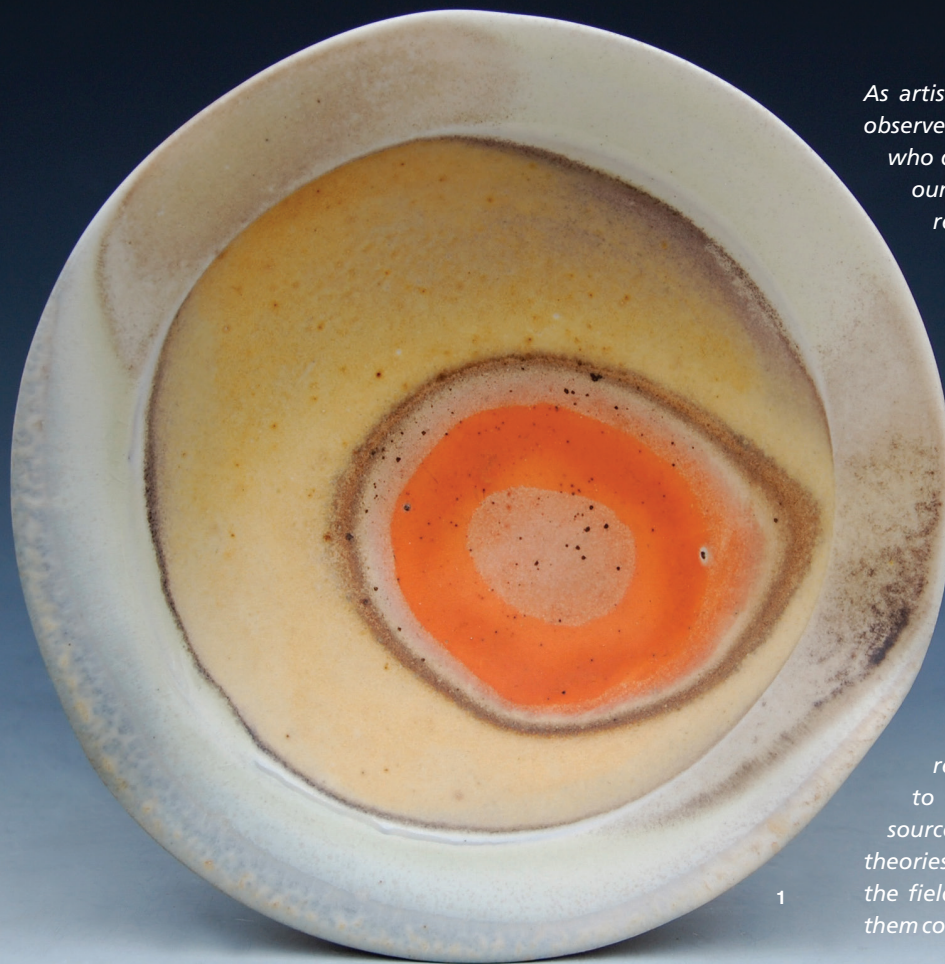


# WOOD FIRING: WADDING

by Simon Levin



*As artists who wood fire, we are more observers of phenomena than scientists who quantify and measure. We hedge our bets. We try to repeat effects while remaining open to serendipity. We have chosen a process fraught with uncontrollable variables. Our kilns are not commercially produced within exacting specifications. Our fuel source, wood, varies widely in silica, water, mineral, and alkali content, as well as species, and density. Among some of the other variables are clay bodies, loading techniques, firing range and duration, and weather and atmosphere. We struggle to test hypotheses because it is hard to control all variables and repeat firings. So rather than trying to present hard facts, this article sources information, observations, and theories from experts and innovators in the field—don't be surprised if some of them contradict each other. —Simon Levin*

## Theories

Wadding is a core material to all artists who fire their work in wood kilns. Wadding is the refractory material used to keep a pot from sticking to the shelf when ash melts or to keep two pots from sticking together. It is central to the process, and like most fundamental things, there are numerous complex approaches and competing theories as to what works the best. None of them are simple.

There are three basic categories of wadding: fire-clay wadding, alumina wadding, and calcium wadding. All are engineered to prevent adherence to the pot, and all happen to leave distinctive marks. Fireclay and alumina wadding are made to be highly refractory, to avoid any fluxing and thus fusing with surfaces of contact. Some are also made to crumble easily after firing, allowing for easy removal. Calcium wadding is designed to dissolve and wash away after the firing.

## Recipes

**Alumina wadding:** This type of wadding seems to predominate in schools and atmospheric firings where salt or soda is introduced to the kiln's atmosphere. The recipe is basically a thick kiln wash, and consists of 50% kaolin and 50% alumina hydrate. There are some variations though.

- Linda Christianson uses a ratio of 4 parts alumina, 1 part EPK kaolin, and 1 part old flour. The low-clay content keeps the alumina from fusing together, while the flour is an inexpensive organic material that burns away. She freezes the leftover wadding between firings so the flour won't rot. She notes that the downside of this wadding is the expense of alumina hydrate and the white marks it leaves on the surface.

Kenyon Hansen, who introduces soda into his firings between cone 9 and 11 in order to erode his glazes and glassify the clay



1 Simon Levin's *Yellow Halo*, 8 in. (20 cm) in diameter, porcelain, Avery slip, decorative fire-clay wadding mark, anagama fired. 2 Ted Adler's 50/50 whiting/plaster-of-Paris cast tripods used to support vessels. 3 The resulting fired mark on the bottom of Ted Alder's vessel from the whiting/plaster-of-Paris tripod. 2–3: Photos: Lars Voltz.

bodies, uses the 50/50 alumina/kaolin wadding recipe. In an effort to reduce the white wadding marks, he makes his wads as small and hard as possible; this reduces the surface area contact while still lifting the pots off the shelf.

Almost everyone I spoke with who used alumina hydrate wadding was looking for an alternative, either due to the white marks it can leave or the cost of the material. Pete Pinnell suggests that the white residue is caused by alumina imbedded in the surface of the clay, with (perhaps) some migration of alumina ions during the firing. Alumina hydrate works well; it has a high melting point and tends not to fuse to either the pottery or the shelf. I found a pretty firm belief in the infallibility of the material. Thus, those who use it seem to see the white marks as a necessary evil, unwilling to try something else that might be a risk.

**Calcium wadding:** This type of wadding developed from the long history of potters using seashells to prevent adherence. The beauty of this method is that the shells (which are made of calcium

compounds), once calcined from the firing, will slowly turn to dust as they gather moisture from the air. Calcining is a process in which a material is heated below its melting temperature to cause thermal decomposition, remove organic material or induce a phase transition. When calcium carbonate ( $\text{CaCO}_3$ ) is fired hot enough, the carbon dioxide is driven off and what's left is calcium oxide (quick lime or  $\text{CaO}$ ). When the quick lime combines with moisture, either in the air or by saturating the lime with water, the  $\text{CaO}$  and  $\text{H}_2\text{O}$  combine to make calcium hydroxide. Soaking pots in water will expedite this process and dissolve any stuck pieces of shell.

The majority of the calcium carbonate won't fuse to clay. Calcium oxide had a melting temperature of 4735 °F. Some of the  $\text{CaO}$  is certainly fusing with the clay and/or glaze, as  $\text{CaO}$  migrates easily in a firing, however, any  $\text{CaO}$  that "sticks" would do so by being chemically combined with portions of the clay/glaze, so it won't be easily visible. Any unreacted  $\text{CaO}$  on the surface would tend to



react with H<sub>2</sub>O and come off. Because this material washes away, it can be used in contact with glazes, leaving a scar on the surface, but not additional material. Seashells, as opposed to fresh water shells, also contain some salt, which volatilizes and fumes locally, glazing and corroding any clays or glazes in the immediate area.

When work is re-fired, it must be re-wadded in the same manner as the first time it was fired. This is because all the other surfaces have ash deposits, which will become a glaze and fuse newer wads in place. Often re-wadding is impractical, in which case seashells or calcium wadding opens new possibilities. Although they leave a small scar on ash-covered area, the residue dissolves away after the firing.

Perhaps because of the land-locked nature of a lot of wood-firers, innovative potters have been making their own shells. Using a mixture of half whiting (calcium carbonate), and half plaster of Paris, shapes can be cast and saved until it's time to fire. A shell can be repeatedly pressed into a slab of clay making the recesses for the plaster casts. Tripods can also be cast using this mixture. The pointed tips of the tripod reduce the contact area with the pot.

- Ted Adler has been using a plaster and whiting mixture as wadding for about 10 years. In graduate school he tried using just plaster, but found that it was too hard and fused to the pots. Plaster of Paris has a melting temperature of 2200°F (1200°C), so at cone 9 the plaster fluxes and melts into the surrounding clay and shelf. By mixing plaster half and half with whiting it raises the melting temperature and makes it release easier and dissolve faster (2–3).

- My neighbor, Gareth Sturms uses thin cross sections of cow bones in place of wadding. He pays a certain price with some unpleasant hours with a bandsaw.

**Fireclay wadding:** When I was in graduate school, visiting artist Kirk Mangus shared his wadding recipe: equal parts silica sand, grog, sawdust, and fireclay. The benefit of this type of wadding is that the mark it leaves is the bare clay color. The fireclay wadding acts as a resist, protecting the area underneath from ash accumulation. It leaves no residue, resulting in reactive clay colors in areas of contact. Years later, in my own pottery, I removed the grog from the recipe because of the cost and I have used this recipe for 15 years.

**Wadding with combustibles:** The idea behind adding sawdust, flour, rice hulls, or other combustibles to the wadding is simple

and seemingly sound. Soft brick is easier to crumble than hard brick, if you can make wadding that contains voids when fired, it will be easier to remove than denser materials. I have accepted this principle, but John Neely disagrees, “So often, people fill wadding up with organic material to make it more friable. I think just the opposite happens; unless it is a really dry firing, the gaps left by the organic material cause the wadding to absorb ash like a sponge.” Instead, John looks for larger-particle, round silica sand, like contractor’s 30 mesh or larger. He mixes the sand and water in a bucket and uses just enough clay to hold it together.

### Application and Loading

**Hanging wads:** To create turbulence and capture the flame path on pots, I often place wads on top of wares, or hang a ball of wadding between two cups. The wadding serves no physical purpose but as a resist to ash, and a way to highlight the narrative process of flame path (4).

**Wadding dams:** In areas of high ash and temperature, many potters use the wadding material to create a small wall in front of the feet of their pots. Place the wadding snuggled up close but not touching these walls limits the amount of ash that will saturate the supporting wads (5).

**Recessed wads:** Since ash runs down the vertical walls of pots at high temperatures, placing the wad a ¼ to a ½ inch inside the diameter of the foot of flat bottomed ware keeps the ash from extending down the wall of the pot onto the wad (6).





**Wadding lip:** On the foot of my pieces, I curl the edge upward slightly making a lip (7) that encourages runny ash to pool (8), and not break over the edge and adhere to the wads.

### Techniques and Tips

**Freezing:** Flour is a common organic material added to wadding. Unfortunately, this creates wadding with a shelf life. Flour easily rots and becomes putrid. Freezing any extra, unused wadding between firings will prevent this.

**Upside down:** Bowls and plates can be placed upside down on a post with a large wad in the center. With the post placed on the edge of the shelf, part of the bowl sticks out into the stoking aisle (9–10). As long as it is placed above the height of the stoke hole, the work is pretty safe from enthusiastic stokers. The rising flame comes from underneath the bowl, depositing a finer ash across the surface that is less likely to fuse to the wad than the heavier ash that accumulates on upright surfaces. In addition to the finer ash, atmospheric effects from the burning organic fumes released from the wood rise and interact with the clay, leaving a narrative of color and flame direction (11).



platters can also span multiple shelves, since the wadding levels the piece over gaps and bumps. In addition to wood firings, this technique can be used in electric and gas firings.

### Aesthetics

Wadding has become integral to my process—no longer a mark that must happen, but a way to capture the flame path and enhance formal elements.

When Linda Christianson started firing in her own kiln, she had few shelves, so she made work that could be stacked rim to rim, giving her more height in the kiln. Wadding became a visible decorative element in her work. Though now she can afford shelves, her casserole dishes are often wadded upside down with wad marks on the rims, and much of her work has strong and generous rims that speak to their legacy of stacking.

Linda was one of my teachers and as I look at the foot of my former apprentice Kenyon Hansen's pots—where each of the wad marks are aligned with the ribs on the bowl—I see the same logic for size, number, and placement of wad marks considered (12).

Many thanks to Pete Pinnell, Linda Christianson, Kenyon Hansen, John Neely, Lars Voltz, and Ted Adler for their help with this article.

*the author Simon Levin is a wood-fire potter from Gresham, Wisconsin who dislikes writing about himself in the third person. He evangelizes for wood-firing everywhere, is a Fulbright Scholar, kiln builder, and writer, but foremost he loves making pottery and big hot fires. You can see more of his work at [SimonLevin.com](http://SimonLevin.com).*



**11** Simon Levin's bowl, 8 in. (20 cm) in diameter, porcelain, Helmar slip, fired upside down in an anagama kiln on a single fire-clay wad.

**12** Kenyon Hansen's serving bowl, porcelain with silica sand and alumina wadding, 2014. Photo courtesy of the artist.