

Raku: The Firing Process

by Steven Branfman



When all this has been done, prayers are offered to God with the whole heart, ever thanking Him for all that He gives. Fire is taken, having an eye however to the state of the moon, for this is the greatest importance, and I have heard from those who are old in the art and of some experience that, if the firing happens to take place at the waning of the moon, the fire lacks brightness in the same manner as the moon its splendour. In doing this, therefore, pay attention to it, especially when it is in the rainy signs, which would be very perilous and must be allowed to pass over, remembering always to do all the things in the name of Christ Jesus.

—Cipriano Piccolpasso

The Three Books of the Potters Art

Our feelings toward the firing of our ware will no doubt be more earthbound and we will feel more in control than did our friend Piccolpasso. Nonetheless, if there is a heart and soul of the raku technique it is the firing process. Our pots, no matter how beautiful they seem to us, are lifeless until they emerge from the kiln. This is where all of our preparation—technical, mental, and aesthetic—come together. Firing is the proof of the pudding and the rope that ties it all together. Even in the raku firing process, which is simple and relatively straightforward, there are variables that can both work against us and to our advantage.

INITIAL PREPARATION

You have located your kiln in the appropriate place and have anticipated and solved all the preliminary problems. You have tested the burners and, yes, they ignite and the kiln heats up. You are off to a good start. Here is a preparation check list:

If you are using propane, wood, or coal, check to see that you have an adequate supply for your planned firings;

Assemble the correct number and size of reduction containers and arrange them for easy access and unencumbered movement around the kiln;

Place your reduction material at a safe distance from the kiln, yet within easy reach for quick access during the post-firing process;

Will you need assistance during any part of the firing? For instance, lifting the lid, applying reduction materials, or turning off the fuel supply? If so, make sure your helpers, whether in a workshop situation or for your own firing, know their jobs and responsibilities;

Arrange for a constant water source for emergency situations and for cooling and washing your pots;

Provide safe, clear avenues for complete unencumbered movement around the kiln;

If you are firing multiple loads, have the next batch of pots preheated and situated for easy loading into the kiln.

Galvanized buckets and garbage cans with matching lids are the most common reduction containers used in raku and are in fact ideal for most applications. They meet all three basic needs: they are available in various sizes to accommodate your ware; are fire- and heat-resistant; and their lids fit snugly, making effective airtight chambers. Galvanized troughs are available at farm supply stores and perhaps at hardware stores that will special-order products. Galvanized cans last a reasonably long time, especially if stored out of the rain. Their one potential disadvantage is that they offer little in the way of insulating value, thus your pots will cool rather rapidly. With large or otherwise sensitive work, this can be a problem. To slow down the cooling of his ware, Wayne Higby uses a wooden box insulated with fiber and lined with thin sheet metal.

The most basic enclosure, and one that might be the only possibility if your work is large, is a hole dug in the ground covered with a steel lid, barrel, or earth.

Susan and Steven Kemenyffy use this method for their grand pieces. Any container is usable as long as it can be adapted to your particular needs and requirements. Be sure to remove any plastic parts from containers you will use as reduction enclosures.

THE FIRING CYCLE

The approach to the firing cycle differs slightly depending on the type of fuel used. Electricity requires the least tending and, in fact, up to the point of glaze maturity requires essentially no tending at all. Gas requires minimal attention, while wood and coal demand continual supervision.

Some potters insist on preheating the kiln *before* stacking the first load. I don't see any reason to do this, thus my first kiln is always fired from a cold start. This gives you the opportunity to stack your first load leisurely and carefully and to use it to fire larger, more delicate pieces that may be prone to breakage. For an electric kiln, load the pots, turn the kiln on high, and come back later. The firing will take two to three hours, depending on the size of the kiln and the condition of the coils.

My firings take one to three hours or longer, depending on the size of the work. If fast firing is your goal, you will need to experiment. Raku can be fired in cycles as short as fifteen or twenty minutes (I have even witnessed ten-minute firings), but understand that most breakage occurs when going from cold to hot (the heating), not from hot to cold (the cooling stage). Your cycles will depend on the clay body, the preheating success, and the initial temperature advance once the ware has been placed in the chamber. If you are just starting out, be conservative and fire slowly until you gain some experience in recognizing appropriate temperature rise.

THE FIRING SCHEDULE

A good initial firing schedule is as follows: Light the burner and adjust the flame so that it is clearly audible. The volume of the burner is an accurate indicator of its intensity and power: too soft a flame and you run the risk of extinguishing it. Begin with the burner head just inside the kiln. This lessens the chance of the flame being extinguished if you adjust it too low. The primary air control and the damper should be open to the maximum. Remember that until your kiln is thoroughly hot, the draft will be minimal and you may notice that the flame is yellow. At this stage, there is little you can do to eliminate flames in the chamber. This is normal and nothing to worry about. As the kiln heats up, the draft will improve and, if you have done everything correctly, you will have no trouble achieving a blue oxidizing flame.

Continue to turn up the burner every fifteen minutes until the glazed surfaces and the bare clay begin to take on a dark gray quality. This indicates that the ware has sintered—i.e., it has changed from a soft state that can still be slaked down with water to a hard, permanent state. Once this darker quality is visible, it is usually safe to turn the burner up all the way.

At this stage, adjusting the firing is critical and demands fine-tuning. At issue here is: firing the glazes so all of the ware in the kiln matures at the same time, or aiming for desired reduction effects, or soaking, to name a few.

As the kiln approaches firing temperature, the chamber will go from no color to a bright glowing orange. At the same time, the glazes evolve from a dry state through various degrees of melting. The first obvious change is when the glazes just begin to melt. Surfaces take on a living appearance, moving and changing almost second by second. I refer to this state as the “ugly stage.” There is the slightest degree of shininess, and the surface looks as if it is about to separate from the pot which would leave areas void of glaze. As the temperature increases, these surfaces begin to smooth out and the glossiness intensifies.

At this point, if you observe carefully, you can see small pimple-like eruptions and pinhole craters on a very shiny surface. What we are looking for now is a smooth, defect-free, shimmering, gloss-like effect on the surface of the ware. This

final state of melting has been likened to “the reflection of water on ice in the sunlight.” I find this to be an accurate and poetic description. Resign yourself to the fact that there is no substitute for experience.

Depending on the rate of firing and the time lapse between seeing the first signs of melting and maturity can be anywhere from fifteen minutes to an hour. When viewing the work, try to spy across the surfaces rather than looking straight down at the glaze. Depending on the glaze, this maturing point may be within a narrow or a wide temperature range. Only experience tells.

In storybooks, kilns fire perfectly evenly and all glazes mature at the same time. This doesn't often happen in real life. Most often glazes closer to the bottom of the kiln will melt before those on top, and you've got to do something about it. One effective means of evening out the temperature is to begin a moderate reduction to slow down the firing and increase the flow of gases and flame through the kiln. In addition to evening out the temperature in the kiln, this process produces interesting reduction effects in your glazes.

Is there an optimum firing length? This question comes up periodically. As far as its effect on the quality of the glazes, the firing time in raku is not as important as it is for a high-fire cycle. The length of firing should be governed by common sense regarding the safe, successful firing of your ware.

UNLOADING THE KILN

Having achieved glaze meltage, the next phase is the removal of the ware from the kiln and postfiring reduction. The usual method for removing ware is to use tongs. Tongs are relatively easy to learn how to use and they keep you a safe distance from your glowing ware. Tongs may or may not leave a mark on your pot at the point of contact. In traditional raku firing, the tongs are cooled in water before being thrust into the kiln. The cool tongs immediately harden the glaze, thus preventing an impression from being formed. In your firing, the first pots may show tong marks, but as the ware in the kiln cools, tong marks are increasingly less likely. At any rate, tong marks should not be viewed as a defect but rather as an integral effect of the raku technique.

Grasping pots firmly but carefully is

one of the more difficult skills to master. It will take some practice to be sensitive to your own strength when squeezing your ware with tongs. Avoid touching thin rims and necks, and allow the weight of the piece to hang freely, thereby eliminating unnecessary stress on the clay. It is generally easier to grab your pots with one jaw on the inside and one on the outside than to wrap the jaws of the tongs around the outside. Depending on the shape of the pot and the extent of the glazed surface, the pot may slip out of your grasp. Narrow-necked forms, unless the neck is too thin in relation to the weight of the pot, can usually be held under the rim by the tongs. Keep the piece perfectly upright to avoid placing unnecessary stress on the neck.

Another method is one developed by Steven and Susan Kemenyffy for lifting large pieces. Incorporated into the design of the piece is a hole running through it. Steven inserts a steel rod through the hole and lifts the entire piece. Alternatively, some pieces are not lifted at all but are tilted with an iron rod or tongs onto a plywood platform (soaked with water to prevent burning) and then carried to the reduction pit and dropped in. Steven and Susan fire in a front-loading kiln, which gives them the ease of access to their pieces necessary for this technique to work.

Yet another method of removing pots is by lifting them with gloved hands without using tongs. While you may think that not having to master the use of those long tongs will make life easier, gloves have disadvantages:

- Their thickness reduces dexterity;
- Gloves designed to increase dexterity may not offer enough protection from the heat;
- The crowded firing chamber makes it tricky to grab pieces without disturbing others;
- Gloves leave marks on glazed surfaces;

Use your hands, without tongs, only when you have absolutely no other way to proceed or for removing large pieces that physically cannot be lifted with tongs. When lifting without tongs:

- Wear long gloves and complete body protection;
- Use a second pair of gloves as “pot holders” to ensure protection from the hot ware;
- Wear a face mask, not just goggles;



Go through a dry run beforehand to make sure you are physically able to lift the piece and place it in your reduction container.

Unloading the kiln begins with turning off the gas at the burner or switching off the elements in an electric kiln. Although it is common practice simply to turn down the burner to a flicker, I see no reason to leave the burner on. It doesn't keep the chamber hot for the next load and it is no big deal to relight the burner for the next firing. Besides, you will encounter enough of a hot blast in your face without a lit burner adding to it. For a woodfired kiln, you will simply cease stoking. Expect flames from wood that is

still burning in the chamber. Open the kiln or, in the case of a top-loader, remove the lid, but be sure you have a safe, fire-resistant spot for the lid to rest on. For a top-loading electric kiln, *do not remove the lid from the kiln*. Use the hinge and lift the handle with tongs. Practice this beforehand with a cold kiln, being careful not to get the tongs caught between the handle and the top course of bricks or electrical boxes when you close the kiln.

POSTFIRING

Removing your work from the kiln and the ensuing postfiring reduction is the heart of Western-style raku. To increase your chances of success, preparation and

speed are essential. I cannot stress enough the importance of preparation.

Place a layer of reduction material—in each container. Sawdust is the most popular, with leaves, hay, and paper also common. Lumberyards, sawmills, and cabinet and furniture manufacturers are but a few of the many sources for free sawdust and other wood scraps. Have the containers and materials in place and the order of events clear in your mind.

For straightforward, no-frills postfiring reduction, shut off the gas, open the kiln, lift out your pieces, and place them in your containers as fast as you can. Just as you were careful in lifting your pots with the tongs, you must be careful when you let them down in the containers. Place the ware gently, carefully letting go with the tongs so you don't nick the rim as you pull the tongs away. Once the ware is inside the container, add more reduction material and cover the container within fifteen seconds to ensure efficient smoking for glaze and clay body development. *You must cover the container tightly or a sudden burst of flames could blow the cover off of the container.* Likewise, if you uncover a container that is smoking a pot, perhaps to place another piece in the container or add additional reduction material, stand back with your face protected. The mixture of oxygen with flames in the container may cause a sudden flareup that can be powerful and scary.

If every step is done correctly (glaze application, firing to maturity, and so forth), the basic reduction technique will result in crackled glazes, mat black clay, and metallic lusters. Speed is paramount to the achievement of these effects.

Additional reduction material should be dropped into the containers from close range, not thrown in. Lightweight materials such as sawdust will simply blow around and end up all over the place. Hot air coming from the container can also blow away the material, creating a fire hazard. Don't be afraid of the flames coming from the container. As long as you are protected with gloves and the appropriate clothing, the flames won't cause injury. The initial burst of smoke during the postfiring reduction phase will last for only about thirty to sixty seconds and need not be any more obvious than the smoke from a barbecue. Of course, you may already have enough reduction

material in the container and may not need to add more after you place your piece inside.

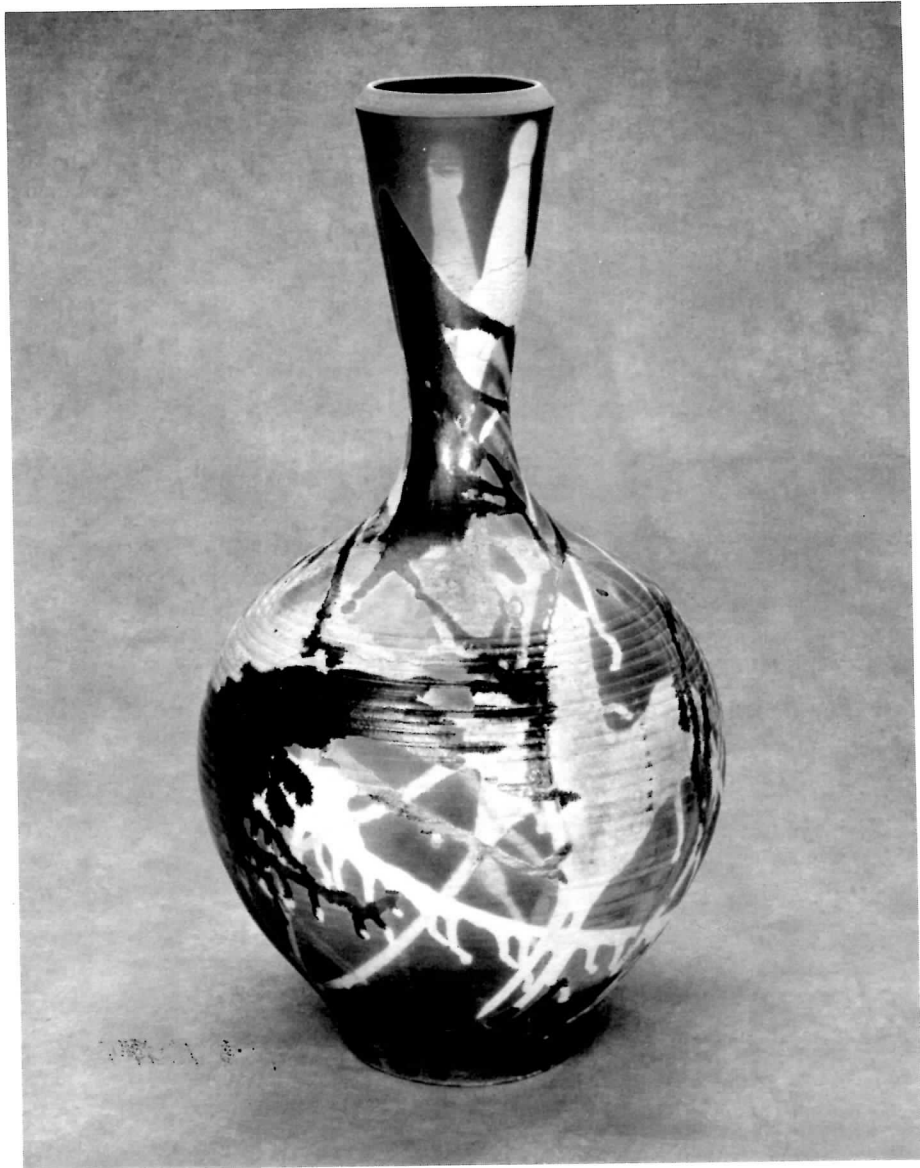
Let me stress: *it is not how much reduction material you use, but how fast you can get the material into the container and tightly covered.* The more airtight the seal, the better the reduction and the less smoke. This can be critical if you are doing raku in your yard and would rather not attract too much attention.

The best seal for a reduction container can be achieved by digging a shallow pit just slightly wider than the diameter of the rim of your container. Place your pot in the depression, apply your reduction material, and cover it with the inverted container. Shovel some dirt or sand around the edge of the container to seal in the smoke and prevent oxygen from entering the chamber.

If you are doing large or unwieldy work that you simply cannot lift out of the kiln either with tongs or your hands, try reducing the piece in place. If you are using a fiber kiln where the entire chamber lifts off to expose the pots, place your reduction materials in a container and invert it over the pot or pots as they are stacked in place. Seal up the burner port and any other places where air can enter the chamber. Be sure that your container will fit over the pots, in both width and height. This is an effective postfiring reduction method providing you can get a good seal between the rim of the container and the base of the chamber. A strip of fiber used as a gasket will usually work.

If you are firing a top- or front-loading brick kiln, shut off the burner, close up the peep holes and burner port, and drop or shovel your reduction materials into the kiln. Immediately cover the flue and make the chamber as airtight as possible. I have gotten mixed results when using this technique, mostly because it is difficult in a brick kiln to create a chamber that is airtight enough for effective smoking.

In workshop situations, I keep the work in the containers until the next batch of pots is ready to come out, anywhere from fifteen minutes to an hour. This is sufficient for most work. For my own work, I keep the pots covered for a good two hours, or until the smoking has completely stopped. This is mostly to ensure slow cooling, important for work twenty-four inches tall and larger.



work, although it is not completely unsafe to use water for small or moderate-sized work. Why risk cracking by fast cooling? Be patient.

ADDITIONAL POSTFIRING AND DECORATIVE TECHNIQUES

Typical postfiring reduction techniques as I have just described have as their main objectives mat black unglazed surfaces, metallic luster effects, and heavily crazed areas. I say "typical" not to denigrate those effects, for there is much about them to keep one busy technically and creatively for some time, but rather to indicate that these are the effects familiar to most potters and those they are most eager to achieve in their initial encounter

with raku. Once you become acquainted with these techniques, you can move on to more complicated ones.

Additional postfiring techniques involve the development of further kinds of glaze and surface effects, the achievement of sophisticated imagery, and the use of various types of reduction materials in an effort to control and shape more carefully the final results. Success in all these areas begins with the correct application of your glaze, slip, or oxide and sufficient maturity in the kiln. Then you can rely primarily on a decisive reduction technique.

Glazes that are applied too thinly will look mat and dry and fail to display the richness in color or crackle effects that

are so desirable to the raku potter. Remember that beauty is in the eye of the beholder. Who is to say what is a defect and what isn't? Many beautiful and distinctive effects have been obtained by intentionally thinning out or underfiring a glaze.

Crazing, or crackling, is another sought-after effect. All raku glazes craze. Dark ones tend not to show off the crackle. Crazing can be accentuated by the direct contact of the reduction material with the surface of the piece. Crazing also is often dependent on a thick layer of glaze that is fired to maturity.

As I said, any carbon-based material can be used. The list includes sawdust (fine or coarse), straw, hay, leaves, pine needles, fruit and vegetable peelings and skins, rags, and paper products. You can also experiment with different kinds of wood. Some potters swear by cherry, oak, poplar, or other woods. I think it is not the kind of wood as much as its form that makes the difference. Nevertheless, given the number of potters who disagree with me, it is worth trying different kinds of wood.

The condition of the material also may affect the reduction results. Three major factors here are particle size (as in the case of sawdust), density (as in the different thicknesses of cloth), and dryness. Dry material ignites immediately, burns hot, and results in the strongest reduction effects. To manipulate these effects, open the reduction container for brief periods, then close it to allow oxidation and cooling to take place. Another approach is to use damp or wet reduction materials. Wayne Higby used damp straw to help cool the piece while reduction was taking place. This process gives his surfaces contact with the material and results in different textures; the amount of smoking results in color effects but prevents the reoxidation effects that would result in removing the ware from the straw.

Direct contact with your reduction material will leave traces of some sort on your pieces. The material will leave physical impressions in the glaze if the glaze hasn't hardened sufficiently before the piece comes in contact with the material. On unglazed surfaces, contact with the material may leave areas of intense black, mottled effects, or other telltale signs of contact. Reduction materials such as pine needles or wood with a heavy resin con-

tent may leave a slight sheen, almost as if rubbed with oil. If you want to eliminate these effects, either prepare an area free of reduction material to accommodate your piece or elevate the piece on a brick above the reduction material. In both cases you will avoid contact between the molten glaze and the reducing agent. In order to ignite the reduction material, you may have to sprinkle in some fine sawdust or have a sheet of paper touch the piece. In other words, experiment.

Sometimes you may want to cool your piece, thereby hardening the glaze, before you apply your reduction material. The harder the glaze, the less smoking will affect it. The Kemenyffys cool their work for ten minutes in the kiln with the gas shut off and the door closed, and then for another minute with the door open before moving it to the reduction pit. There, they are careful to use only sheets of cardboard as reduction agents in order to avoid the kind of intense local areas of reduction that can come from contact with fine materials like sawdust or straw. It is the combination of the harder glazes and their reduction style that gives them their desired results. Since their work is large, their pieces retain more heat and cool more slowly than smaller pieces would. A much shorter cooling time would be appropriate for smaller pieces.

An oil-impregnated rag or a bed of oil-soaked material also offers interesting reduction effects. The oil provides intense local reduction that often results in strong metallic effects and a fine network of small crazing and crackles. I have also had good results using oil on a copper mat surface. Avoid using fresh, clean motor oil. It is too rich and almost always leaves an oily residue on the ware that is difficult to wash off. Used motor oil works well and is abundant and free. Exercise caution when using oil as it ignites immediately and creates a lot of smoke.

Water is an effective postfiring medium. Remove your piece from the kiln and place it on a brick or concrete block. Spray water on a section of your pot to stop the reduction process while applying sawdust or an oil-soaked rag to another section. Other postfiring techniques include the application of additional reduction material after the pieces have been in the container smoking. Lift off the lid carefully and expect a

sudden burst of flame. Apply additional material and re-cover. This will often result in a darker unglazed surface.

If you are interested in intense luster and black effects achieved through concentrated smoking, you will need to learn more about the properties and characteristics of smoke and carbon and how to regulate them. Your ware, depending on its surface treatment of slip, glaze, underglaze, oxide, or Mason stain, reacts variously to the smoking of postfiring reduction. Each has its own degree of "resist" to the carbon which affects the carbon absorption. An example is the "halo" effect developed by Paul Soldner and subsequently adapted by many potters using their own versions of the technique.

Kerry Gonzalez uses commercial underglazes to which he adds small amounts of borax as flux. The mixture is applied with a slip trailing bottle and tends to melt slightly more toward the edges of his designs. In a soft, even-smoking atmosphere created by using newspapers as the reduction material, the carbon is resisted by the fluxed edges, resulting in the halo. A bed of opened, uncrumpled newspaper cradles the pot. Gerstley borate may be better than borax because of borax's granular nature and solubility. Kerry adds just a few grams per three-ounce bottle of underglaze.

Jim Romberg manipulates the smoking phase to achieve certain effects. He decorates his pots with a variety of glazes, slips, and oxide mixtures of copper, cobalt, and iron. He uses a variety of application techniques as well, including pouring, brushing, and spraying with an atomizer. The key for Jim, however, is carefully controlling the reduction through the use of newspaper and a series of reoxidation steps: opening the container, placing more newspaper on certain areas of the piece, and moderating resmoking by partially closing the container. His work displays dark areas where the reduction was heavy, as well as gray-to-white areas that are the result of little smoking.

Jerry Caplan has developed an interesting reduction technique. To the surface of a biscuit-fired bowl or platter, he applies a slip formulated for application to a wet piece. While the form is still wet, he carves a pattern through the slip with a needle or other fine-pointed tool. As it dries and shrinks, the slip naturally curls

away from the surface into "islands". Carefully, so as to not disturb the patterns, he places the ware in the kiln and fires to maturity, approximately 1800 degrees F. Equally carefully, he removes the ware from the kiln and places it face up on a flat surface covered with sheets of folded newspaper. He places more folded newspaper over the top of the piece and covers the work with a trash-can lid or inverted container. The reduction process must be quick and the container must have a tight seal. Jerry ensures a virtually airtight seal by using a ring of sand as a gasket upon which the container sits. The now-fired slip that remains on the piece acts as a resist to the smoking of postfiring reduction. After cooling, the ware is taken from the container and the slip resist is emptied off as it is not fused to the ware. Jerry washes the work to remove any residue and slip that may have adhered to the surface. This resist technique imparts a soft, quiet character to the piece.

Jerry's reduction technique has been called by him and others "smokeless raku." This has led to some misconceptions about the raku firing process. *No raku postfiring technique that involves reduction through the use of combustible material can be "smokeless."* It is a dichotomy of terms. While I have never personally witnessed Jerry's technique, I can surmise from my own experiences what goes on. Through the utilization of newspaper or other less potentially intense reduction materials, and by carefully creating a tight seal between the rim of his containers and the earth, the amount of airborne smoke is reduced to a minimum. It is not possible to reduce it completely, however, and thus even the smokeless raku technique does not bring the process indoors, as some have been led to believe.

The copper mat effect itself can be difficult and frustrating to achieve. It is in fact as much a postfiring technique as a glazing or decorating technique. Begin by applying a thin layer of copper mat stain for the most consistent results; the layer will seem almost too thin. The most effective means of application is spraying. Use an airbrush with compressor, atomizer, or a simple spray bottle. At the Wesleyan Potters in Connecticut, I was introduced to a garden sprayer that works by effectively pumping up its pressure.

Place some reduction material in your container and place your piece on a brick. The brick will isolate the piece from prolonged, direct contact with the material. Place some reduction material over the piece and close the container quickly. My former assistant, Mark Dellorusso, achieves consistent results using this technique with dry leaves as his reduction material.

A variation of the copper mat effect is to rub a thin iron oxide wash or dry iron oxide into the surface of the piece. The iron will act as a resist to the carbon, resulting in an earthy surface reminiscent of reduction-fired stoneware clay or the familiar yellow mat effect. To achieve this result, partially reoxidize the piece after a brief period of smoking, by uncovering the container and adding more reduction material.

Indiana potter Dick Lehman discovered a technique combining the copper mat effect and direct contact with reduction materials. Dick came across this process quite accidentally when a piece straight out of the kiln rolled down an embankment into some wet grass. He retrieved the pot, put it in the reduction container and, upon examining it afterward, noticed a remarkable photo-like image of the grass on the pot. Dick sprays a copper mat stain on the ware in a thin layer. He has used a mouth atomizer, an atomizer connected to a compressor, and a conventional air brush and compressor, all with excellent results.

If applied too thickly, the copper mat will flux and the subtlety or even the entire effect will be lost. Firing proceeds at a normal raku pace. Dick fires with natural gas, using twenty-minute cycles in a fiber-lined garbage can. In a departure from the usual, he uses a small cone 011 to guide his firings. (Actually, using a cone when firing a load of all-copper mat pots is a good idea since you have no melted glaze by which to judge maturity.) When cone 011 is flat, Dick removes the pots from the kiln and places them out in the open on a bed of prepared sawdust covered with fresh-picked leaves and grasses. After thirty or forty-five seconds, color begins to develop on the side of the ware where the flames lick up. At this point the piece is covered in place and allowed to reduce completely. As a variation, uncover the piece after five minutes or so of reduction for three or four seconds of oxidation. Doing this enhances

color development.

Fuming, or the application of metallic salts to the surface of your ware, is another technique whose roots are not in raku at all but has been adapted to the American raku process. Related to salt firing or vapor glazing, fuming can add lustrous gold, silver, and mother-of-pearl effects to glazed surfaces. Metallic salts can be used as a wash or as components of glazes. Their use here offers an alternative method of application, which can result in varying, though not necessarily better, effects.

Most commonly, fuming is done upon maturity. Remove the ware from the kiln and place it on a brick pad. Spray a solution of silver nitrate, stannous chloride, or other soluble salts onto the piece. As you do this, you can combine localized post-firing reduction techniques with water-cooling techniques to control the final outcome. In this case, try using water as a fix on the fumed area to lessen the chance of the fumed effect being a fleeting one. As the color develops, cool the area with a water spray or simply dunk the entire pot in water.

Fuming can also be carried out by introducing the salts into the kiln during the last stages of the firing, as in salt firing. Whatever method of fuming you try, protect yourself from the fumes by working only outdoors while standing upwind. Other salts used in fuming include cobalt nitrate, cupric chloride, chromium nitrate, silver chloride, and zinc oxide. I repeat my cautionary note: metallic salts are corrosive, and silver nitrate will stain your skin and clothes. Wear rubber gloves.

Falling somewhere among fuming and vapor glazing and saggar firing, is the technique of placing salt, powdered oxides, and soluble salts in your reduction containers along with more conventional reducing materials such as sawdust or straw. Upon ignition from the heat of your ware, these materials will volatilize to effect changes in your glazes and surfaces.

CONCLUSION

While even I admit that the firing process is the heart and soul of the raku technique, it is but one aspect of the process that comprises many components. These include clay, glaze, fuel, and aesthetics, as well as the potter's own drive, desire, and imagination. Success results when a balance of all is reached. Don't make the mistake of singling

out the firing process, or any other step, as the one to make the difference.

Right and wrong, good and bad are aesthetics that are measured within criteria set up by yourself. It is not so important that a particular process or technique works correctly by some other person's standards as it is that it satisfies your own sensibilities and expectations. Keep an open mind. Embrace unexpected results without the encumbrance of a predetermined formula. Are we talking copout here: take whatever you can get and be happy? Not at all. Throughout the entire creative involvement truth and honesty in relation to your own aesthetic standards must be maintained. It is this dedication to veracity, not compliance to

technical matters, that forms the farthest boundary of creativity.

Note: *The foregoing article contains excerpts from Steven Branfman's recently released Raku: A Practical Approach, published by Chilton Books. It appears here by permission of the author and publisher. The book contains a complete study of raku including its history, aesthetics, kiln building, and all phases of its processes, as well as related techniques such as pit, sawdust, and vapor firing. It is available through selected outlets and at The Potters Shop.*

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