Aluminum Foil Saggar Firing

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Saggars are simply refractory containers designed to subject the ceramic work placed in it to an atmosphere of the makers' choice. Whether you are trying to protect the work from the kilns atmosphere as in the case of Song and Ming Dynasty porcelain. Or influencing the atmosphere within the saggar, by creating an environment of carbon and fumes from the combustion of organic and inorganic materials and metallic salts. These materials volatize during the firing process and impart stunning surface effects to the ceramic work.

Although saggars can be made of many things (clay flowerpots, tin cans, paper bags dipped in refractory slip to name a few) we are focusing on aluminum foil saggars and very low temperature firing.

There are a lot of aluminum foil products on the market but not all are created equal. I have found the less expensive foils, being thinner, tend to burn up sooner than the Heavy Duty Reynolds Wrap (my wrap of choice). I pick up the two-pack at Costco when it's on sale so I have it around when I need it.

The melting point for aluminum foil is 1221°F (The melting point of the foil, which is about 97% aluminum) is the same as that of aluminum, that's the simple fact. When researching aluminum foil saggar firing reported temperatures of melting aluminum foil vary a great deal, from 1100°F to as high as 1500°F. These reported temperatures for this firing technique are all over the map because as with any firing, these firings are influenced by many factors. What foil you are using, how many sheets of foil you wrap your work in (more layers = more insulation), how much work is in the kiln, is it tumble stacked and insulated by other work around it, hot and cold spots in the kiln, how fast the kiln temp rises and the quality of pyrometer and thermocouple are main factors but the thickness of the work also plays a role along with what combustible material and how much is used. All of the aforementioned are what we ceramist understand as "heat work". The use of cones is not that helpful as they tend to take too long to mature for the quick fire method I prefer to use. I have burned foil at Δ 019 in an electric kiln (not recommended as the vapor can damage and shorten the life of your electric elements) using "Cone Fire Fast settings. You are better off to program a full ramp (9999) to desired temperature depending on your kiln (insulation, elements, etc.) perhaps 1150°F or so. Anyway, I prefer to visually monitor the foil, for me this is the best way to determine when the work is ready. The strong odor of hydrochloric acid is a good indicator the firing is close to done (not a good smell and not good to inhale). I watch for the foil to begin to lose its sheen. It will begin to puff up like "Jiffy Pop" popcorn and turn gray in color. The foil becomes ash and you will find beads of aluminum if over fired, but don't be alarmed you can still obtain great results if this happens. For

the sake of communicating a better understanding of my firing approach, I used my pyrometer and will defer to the read out temps and time. I've fired my kiln to temp. in as little as 27 minutes but I prefer the results I get firing my clamshell kiln to approximately 1468°F in about 45 min. In the first 15 min. my kiln is over 1000°F. In another 15-16 min. the temp reaches 1336 - 39°F and the foil is turning gray. Five more min. at 1396°F all the foil is beautifully even and gray. Another 8 min. at 1468°F, I shut the kiln off. This firing was 44 min. start to finish, the next firing who knows?

We are firing at the very lowest end of these chemical metallic salts volatilization point. If you wish to experiment with higher temps using foil there are products on the market that will allow you to do so but are not cost effective.

Chemical Solutions: Assume all of these solutions are dangerous and handle them with do caution and care. I recommended using Nitrile gloves and a well-fitting respirator with NIOSH approved cartridges for fumes, vapors and gasses when applying to and handling your work. The respirator is also recommended when hanging around the firing kiln.

Ferric Chloride or Etchant solution is one of the most reactive and therefore widely used metallic salts for low-fire surface enhancement. Its iron base contributes yellows through soft pinks if diluted with water. Used full strength oranges, browns, reds and purples are possible. It is very reactive with the foil. The solution contains Iron chloride and hydrochloric acid. It is corrosive and reacts with most metals. It can be neutralized with soda ash or lime but that produces carbon dioxide, which is also dangerous in confined areas. Small amounts are sometimes available at Radio Shack for around $10.00. Gallon size containers can be purchased at art supply stores like Daniel Smith for around $20.00. Or if you have an inner Mr. Science lurking in you, you can make your own with iron oxide or steel wool, Muriatic acid and hydrogen peroxide. There are plenty of instructions on the Internet, but do be careful.

Solutions:

- Copper Sulfate Solution: 100 grams to 1 pint of hot water. Produces very light greens and pinks to red in some cases.
- Cupric Chloride solution can also be made from any source of copper, muriatic acid and hydrogen peroxide. Very light green by its self, stronger reaction when applied over or under another metallic solution.
- Copper carbonate and water is much less harmful and will also produce light greens, pinks and reds.
- Cobalt Sulfate Solution: 100 grams to 1 pint of hot water. Produces grays and blues and reacts nicely with the foil. Also stronger reaction when applied over or under another metallic solution.

- Potassium Dichromate Solution: 100 grams to 1 pint of hot water. This is “Mr. Nasty” be especially careful with this chemical in powder form or solution it is very dangerous. It produces beautiful greens from subdued army green to harsh chrome green and is very reactive with the foil.
- Sodium Chloride (table salt) and Magnesium Chloride (Epsom salt) can be made into saturate solutions by adding the material to hot water until it can dissolve no more. Whites, soft yellows and pinks are produced from these.
- Other solutions may be experimented with just be careful.

Application:

These solutions can be sprayed, poured, dipped, brushed and sponged on to your work. If spraying use a nonmetallic plastic sprayer and be very careful of draft, wind conditions and environment. If brushing use inexpensive wood or plastic handle foam brushes. Dipping or pouring, use plastic containers.

Dry Materials:

- Coarse table salt
- Sugar
- All of the above solutions can also be used in dry chemical form

Inorganic Materials:

- Coarse steel wool
- Fine steel wool
- Horse hair
- Copper tined wire
- Chore boy copper scrubbers
- Masking tapes
- Glue sticks and spray adhesives can be used to adhere materials to your work but will have its own influence on the outcome of the work.

Organic Materials:

- The list is endless from banana skin to seaweed to dry cat food, I prefer to use whatever is available and green not dry.
- Sisal or jute twine is great alone or soaked in salt solutions, added to the work wet or dry.