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Zircon kit instructions:

The zircon kit is a two part mixture of 200 mesh milled zircon (zirconium-silicate) with a liquid vehicle, colloidal silica. When this is mixed to a slurry and applied with a brush it makes a highly refractory ceramic shell which can protect the softer, more vulnerable kiln or furnace insulation.

I first became interested in this zircon shell material when I saw it used for ceramic shell molds in a stainless steel foundry. The molds were taken directly from a hot kiln and positioned on the cold floor and poured. The ceramic material was strong, refractory stuff which could withstand heat changes well. I started using it around the shop. I painted soft brick, Fiberfrax, just about everything. It worked very well on some things and just so-so on others. I used it on enough things over time to feel comfortable writing about its suitable limits.

Before you begin, remember, **DO NOT FREEZE!!!** The liquid part of the kit is fragile. The liquid freezes at 32 ˚F and will be ruined. So keep the jug of colloidal silica in a warm place year-round.

General Safety Rules — This kit is easy to work with but for your personal safety and comfort wear rubber gloves and a respirator. Do not breathe the dust or mist. Do not eat. Prolonged skin contact can cause mild irritation and skin inflammation.

To Apply — Use plastic bucket and brush with natural or plastic bristle. Use a stainless steel spoon to mix with. The Zircon settles out of suspension quickly and must be mixed constantly so mix only as much as you need for each application. Rinse tools in water for clean up.

Zircon is dense and hard and has very low thermal expansion. It behaves "excellently well" around glass. It has long been known as a good liner material for tank furnaces as in **AZS**. I like it because glass doesn't wet zircon very easily. It makes great "low stick surfaces" such as around doors and lids. In my shop there are a few places where no matter how careful I am, with time, some glass gets dripped. When I paint the drip with "z-wash" it becomes a dry surface again.

I use the "z-wash" as a glue, a mortar, and a rigidizer for frax. I also use it for a hot surface paint (like white-wash, but good to 2800˚F) and it is good for repairing ceramic burner heads. A repaired head is as strong as an original! My glory hole burner was cast in 1972. It has been in service ever since (with 2 repairs in 26 years).

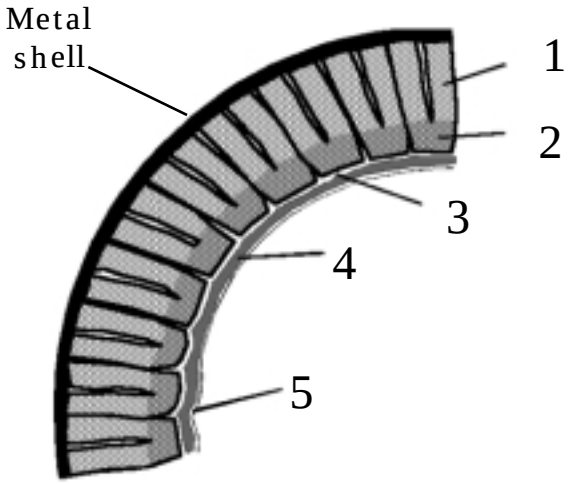
The colloidal silica part of the kit is interesting stuff— it's what most people call "frax rigidizer" for Fiberfrax. This part can be bought by the gallon. It is expensive ($50.00 to $75.00), but it does a lot! Here's how I use it.

To rigidize frax I mix colloidal silica and water and paint or pour it onto the “frax.” Squeeze out the extra liquid, if possible. I even drive my truck over it (as between two boards) and save the juice for further applications. This will firm-up like fiber-board when dry. It is less insulatory than fluffy-frax. When stiffened it is "somewhat refractory."

To apply a zircon shell onto a Fiberfrax wall, you must first rigidize some portion of the “frax” wall, say the first inch or so. This gives a structure or foundation for the zircon shell to stick to. Without this foundation the dense zircon shell and the fluffy Fiberfrax have little in common and the shell will just fall away from the frax. So we create this middle ground, rigidized frax, which is friendly to both the fluffy Fiberfrax and the dense shell.

Here is an example of how I make a furnace wall using this technique.

Ceramic shell coating over Fiberfrax (for use in vertical walls)



Detail, top view of cross section through wall

1. Accordion style ceramic blanket installation.

2. Wet the interior edge of the Fiberfrax (first 1-1/2") in 50% colloidal silica and 50% water, then fire to bone dry. This stiffens the "frax." Use a brush to apply liquid mix.

3. Brush on a thin slurry coat of zircon & colloidal silica—1/16" thick. This too can be heated rather rapidly to a bone-dry condition.

4. Use A. P. Green T-36 mortar or equal. Apply 1/8" thick—dry slowly with low heat (under 150°F) until dry. Then fire to 1600˚F.

5. Brush on final coat of zircon slurry to 1/16" thick.

Between the layers of "z-wash" I add a sandwich of high-grade mortar which adds a dimension of stability to the "z-wash." This is especially useful in fiber furnace wall construction, especially where we are going to 2600˚F as in a glass melting furnace. Even so, I have not used this in a large furnace, but I have used it for years in my 30# free-standing furnace. I occasionally have to repair a small crack in the surface of the shell. But when I used the "z-wash" without the mortar layer I would often have to repair large sections (apx. 3" x 3" square) which would separate from the "frax."

I skirted the issue of size. My gut feeling tells me to keep it in the fifty-five gallon metal drum range for glory holes & furnaces. Any bigger and I know a new and unforeseen set of circumstances awaits that adventure. The weight of the shell and the fact that it gets a little "soft" at the upper temperatures makes me very wary of pushing the issue. I suspect the shell would simply spall from the frax especially where it would span an arch (as over the crucible). Can you imagine what "z-wash" and 150 lbs. of clear crystal would look like together?

What works and what doesn't—

This shell product is useful to the glass craftsman to protect against loose fibers which could become airborne and pose a health threat. In lower temperature areas of the furnace exterior where fiber-blanket is exposed cover with fiberglass cloth and paint cloth with zircon slurry. This makes a very tough surface where no loose fibers can escape.

To make a tougher product which is rigid but flexible, like a fiberglass car fender, use many layers of fiberglass cloth and the zircon slurry. This can be sanded and shaped just like working with fiberglass resin bonded products. I have made many unique cast-fiber parts, such as the lips to the GIBERSON BEAD FURNACE using this technique. Don't put the fiberglass cloth where it will get more than a possible 1000˚F in direct heat. In those areas just use the zircon-slurry over the fiber, solo.

Again on the best side of things, the repair of small cracks and the delicate filling in of holes on speciality items such as the Giberson Ceramic Burner, U. S. Patent 3697000, makes this a must in the repair shop. If a head is broken in half, wet both halves in the pure colloidal silica. When totally soaked, take a small brush and paint about a tablespoon of slurry in the joints and set the parts together in their proper position. Let this dry in a warm place for the entire day (like in a kiln at 200˚F). In the morning, wet the entire burner using just the colloidal silica. Repeat brushing the slurry into the cracks. Between each application use a Q-tip to clean out the gas ports. If you have a large gaping hole, you can fill it with crushed firebrick mixed with slurry. Let this dry to completion after each applica-

tion. This could be a tedious operation if you had to repair more than a couple of heads a year. That's why I don't do a repair service.

For resizing the holes in a burner (for making the holes smaller) mix the zircon powder in a liquid mix of water and colloidal silica, 50/50. This makes a drillable material which becomes hard upon vitrification.

The worst place I have ever seen this zircon shell used is over genuine fiber board. I don't know what's up with that combination, but they are just too dissimilar. The zircon shell falls off in big sheets. It cannot get a grip into the board. Another bad place I used the combination of board and shell was in the bottom of the annealing kiln in a school situation. Initially, it seemed like a good idea, but when the big glass objects got dropped into the kiln with a thud each left a big crater. I should have put a hard material on the floor, like 1/2" kiln shelf to protect the softer block insulation.

That's about it for the zircon kit. I am not sure the whole story has been written. When working with the product remember to use caution: always wear your respirator and don't breathe the dust.

The "z-kit" comes in two sizes:

One Pint $30.00

One Quart $45.00

plus shipping.

For larger quanities contact bulk dealers or perhaps get your local ceramics supplier to carry milled zircon and colloidal silica, which are common ceramic materials.

Dealers for milled zircon:
Ceramic Color And Chemical Co, P. O. Box 297, New Brighton, PA 15066 (724-846-4000)

Dealers for colloidal silica:
NALCO CHEM CO, 800-708-3216
RANSOM AND RANDOLPH, 800-800-7496 OR 419 865-9497