Introduction

June 2006

My name is Bernhard and I live in Namibia. I have an FC project in mind [and have had since about 2003], which comprises a cluster of seven tetrahedrons with the outer members removed and the resulting hyperbolic paraboloid surface covered in FC. As the surface will be open to atmosphere on both sides drying of the mortar is going to be a serious problem.

There has been mention of Waterglass in the discussion list as an accelerator and also as a hardener/strengthener in cementitious compounds so I did an Archive search, downloaded all the e-mails and then compiled the following document.

In my attempt to balance brevity and comprehensiveness, I have used my own discretion and have retained the author's name at the top of each message [other than for the odd glitch or three]. Some of the info is not directly FC related and even goes off into thermal things about chimneys, making silica paints and the like. I have retained these because they are needed to give context to the waterglas related comments made, and because they do link back to FC.

In the processes of copying the e-mails from the Archive, I was not consistent and some have titles while others do not.

Within the text of the messages, I have highlighted waterglass, sodium silicate and potassium silicate in all the places that I did not miss. In some messages I have highlighted a whole string of text because I found it all relevant.

I hope some of you oldies, and especially newcomers, find this info useful.

-Water glass –
Extracts from from FC.net Discussion Group

- *From*: Richard Austin <healthstyle@earthlink.net>
- *Date*:2000-02-03

Also...
If you've seen the geopolymer site it incorporates both these ideas mentioned. **Geopolymers are essentially a sol-gel chemistry of adding waterglass (either sodium or potassium based) to alumino silicates (clay).**

The result is an inorganic polymer which sets to full strength in minutes or hours depending upon temperature. Dr. Davidovits uses microwaves to rapidly harden the material.

See more at: http://www.geopolymer.org/

Gravel/sand/clay test

- *From*: "Loren" <loren@ipa.net>
- *Date*:2000-02-03

Wayne,
Really want to try something with the soil? Take a quart jar and put normal soil (no top soil, or organic matter) in the bottom third. Next fill with water to within 1 inch of the top and put the lid on and shake it and set it down and write down the measured amount that falls out in the first 10 seconds--gravel, then 10 minutes--sand, then the next morning--clay Turn those into ratios and lets see if we can formulate an admixture to make it workable. I'll even send you some fibremesh if you want to do this. It is a polypropylene fiber which is wonderful in cement. I can eliminate layers of mesh by using this additive.

Peter E.

- *From*: Richard Austin <healthstyle@earthlink.net>
- *Date*:2000-02-04
  - From: "Loren" loren@ipa.net
  - > Date: Thu, 3 Feb 2000 22:45:11 -0600
  - > Subject: [Ferro Cement] Re: Re: Re: Re: Re:acrylic mix
  - Dr. Richard,
  - SNIP
  - Yes, I'm talking about using earth as a construction material by turning it into stone using **waterglass (sodium silicate) or potassium silicate**. There is a way of making a foaming machine by adding Ivory soap to water, pumping air through to make fine bubbles (aquarium bubblers) and feeding through a pipe (or hose) filled with kitchen scrubbers. Comes out like shaving cream. This is folded into cement (or earth/silicate) and makes a foamed product.
  -
  - It looks like Davidovits may have a better way.
  -
  - A foamed product would be the core. Also, I'd like to use clay/stone for the strong shell layer as well. See the geopolymer pages I referred to earlier as well as:
  -
  - http://www.abc.net.au/quantum/scripts98/9818/rundown.htm#pharoah
  -
  - Apparently contaminants don't matter and lots of earth particles (every thing but clay) could be encapsulated by the **clay/silicate reaction**.
  -
  - The idea is to use the earth on site by evaluating the amount of clay and adding an inorganic reactant to change it into stone.
  -
  - How was Pliny making foamed earth?

- *From*: Richard Austin <healthstyle@earthlink.net>
- *Date*:2000-02-06

His method is to combine waterglass with the raw materials to make it into rock again. Clay + waterglass = rock.

- *From*: "F. Marc de Piolenc" <piolenc@mozcom.com>
- *Date*:2000-02-07

Making **waterglass** is relatively easy, and is similar to primitive glass manufacture. I have a procedure from an old soapmaking text (waterglass is a useful additive to soap), if anybody is interested. I can send it privately or to the list.

Waterglass sets by exposure to carbon dioxide in the atmosphere or in the material being bound, ***so adding small amounts of a carbonate to the mix speeds up set quite a bit.***
Marc de Piolenc

- *From*: Steve Millward <millstev@isu.edu>
- *Date*:2000-02-07

In the meantime I found the following tidbits while doing a search on **sodium silicate**. I thought the perlite might have some insulation applications for our group. There is a place where they make perlite about an hours drive from me.

Expanded perlite granules can be bonded to form rigid shapes for a very wide range of applications. The most suitable binder for many purposes is **a liquid sodium silicate similar to traditional "waterglass".** ***The liquid sodium silicates are solutions of water soluble glasses manufactured from varied proportions of Na2CO3 and SiO2, providing a wide range of chemical and physical properties.***

Sodium silicates are widely used as high temperature adhesives and binders due to the following properties.

Low cost
Inorganic
Easy to handle
Rapid controlled set
High strength
Insolubility (when aired)
Chemical stability

Silicate-bonded perlite makes an insulation material which is completely non-flammable, the refractory nature of the bond being a major advantage.

Potassium silicate is sometimes preferred for applications where heat insulation and fire resistance are the main objectives. This material has a slightly higher softening point than its sodium counterpart.

Sodium silicate is widely used as a binder for molding sand in foundries. The technology for perlite/sodium silicate composite manufacture is based largely on this foundry industry experience.

Perlite/Sodium Silicate Technology
A wide range of formulations of perlite, sodium silicate solution and setting agent can be used, together with additives to control the absorbency of the perlite and the speed of setting of the mix. General guidelines are given as a starting point.

Soluble Silicate Grades
The choice of grade of sodium silicate solution depends on the application and setting process being used. Generally, a higher silicate to alkali ratio gives faster setting while lower ratios and higher solids contents give greater strength in the finished product.

and also:
Silica aerogel is fully dehydrated silica gel; it is very porous and is often used in insulation, e.g., for refrigerators.
Cheers,
Steve M.

- *From*: "F. Marc de Piolenc" <piolenc@mozcom.com>
- *Date*:2000-02-07

Preparation of Silicate of Soda –

Gossage prepares **silicate of soda or silicate of potash** by fusion, much in the same way as that adopted in the production of ordinary glass. He mixes together about *equal parts of dry carbonate of soda and clean sand, to which is added one part by weight of ground coke or charcoal for each nine parts by weight of carbonate of soda*. This mixture is melted in the same way as mixtures of sand and alkalies are in glass-making. The melted mass is afterwards poured into cold water, which renders it more friable. The product is then ground to a fine powder, and afterwards dissolved by boiling in three or four times its weight of water. During the boiling liquid caustic soda is sometimes added. After reposing for a few hours the clear liquor is drawn off and concentrated by evaporation until it assumes a viscid condition suitable for mixing with pure soap.

Preparation of Silicate of Potash. -In making silicate of potash, twelve parts of dry carbonate of potash, two parts of sand, and one part of coke or charcoal are mixed together, and the whole melted and treated as above. In place of sand, ground felspar may be used, in which case three parts of this mineral are substituted for two parts of sand, and only one-half the quantity of alkali is used.

Sulphate of soda or sulphate of potash may be used instead of the carbonates of soda or potash in making the "soluble glass," in which case three parts of either sulphate are substituted for two parts of either carbonate, and four times the quantity of coke or charcoal above given.

- *From*: Richard Austin <healthstyle@earthlink.net>
- *Date*:2001-03-02

> It took me awhile but I have confirmed that a Canadian company with the **sawcrete blocks preserved with a siliconizing process is just using water glass, 1%.** The french Hemp Co. alluded to that, and that their secrete process was "better". Well 50 years and the Canadian stuff is still standing, so that will do for me.
Alan,

Are you saying that the addition of 1% waterglass reduces the alkalinity of concrete to make bio-reinforcement possible without degradation? If so, it would open the door to polyester as well.
Peace and Health,
Richard

From: fractional@willmar.com
Date:2001-03-02
Hello Richard,
I presumed the **water glass** was preapplied to the sawdust (and possibly dried?) before exposure to the cement mix. Not being a chemist I don't know what liquid water glass would do to the alkaline nature of the mix but I doubt it would change that**. It's referred to as a preservative, not an alkalinity modifier**. That is possible with very involved CO & CO2 techniques, perhaps many others, but none that are do-able or affordable. **Sodium silicate will soak into natural fibers like "water",** of course there is substantial water there. If you have had the misfortune of using a "plastic" bath towel you already know it will not absorb moisture. We can presume the water glass would sit on the surface till it flaked off.

There is some web based literature on the supercritical treatment of cement concretes for ultra high strength, and alkali abatement. Even more in the patents.

However JUTE string would suck it up very nicely. That went right by me, glad you mentioned it. I used to wind up a few italian can shells with jute string, incredibly tough stuff, and NON stretchy! It also has a great fibrous texture to grab onto the matrix with. The source of Jute escaped me but an initial search didn't help either. BUT I did find a source of Jute Geotextiles! http://www.jute.com
Look under products/geotextiles. They estimated UK L .40 to .80/sq-yd. So the price is good, but several layers would be needed. But it's a thought. It would be flexible if woven, suitable for organic shapes. Some of the burlaps I've used have been weak, do you know what fiber is used in burlap?
Alan

From: "Martin Iorns" <miorns@att.net>
Date:2001-03-19
Hey, Nolan! Yes, I've used a lot of foam, but not to replace the laminated reinforcement. You cannot use foam INSTEAD of laminating, but foam DOES make an excellent core for the laminate.

The 15-ft-wide decks of our 55-ft Valeo series boats contained 1-ft x 2-ft x 1-in-thick blocks of rigid urethane foam sandwiched between one layer of 3.4# expanded metal lath and 1-in x 1-in 14-gauge welded wire fabric. Shear ties are placed around the perimeter of each block to hold the upper and lower laminate together. In marina floats that are too small for persons to work inside, we laminate any type of mesh over blocks of expanded styrene beads**. Laminates can also enclose cores of styrofoam, perlite, paper, saw dust, or other filler material bonded with waterglass or another adhesive compound.**

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> ----- Original Message -----
> From: Nolan Scheid <nolan@clipper.net>
> Sent: Saturday, March 17, 2001 3:26 PM
> Subject: [Ferro Cement] Foam cores and Martin's lamination methods
> > Hey Wayne, Go the next step. If you used cheap foam inside of Martin's > lamination methods, you would have a very strong insulated structure. I > wonder if Martin has laminated over foam?
> N.

From: Herbert Crow <wcrow@telepath.com>
Date:2001-03-19
Hey, did I say Mr. Irons was a gold mine or what? This is great! My only problem now is I see about 6 new solutions I would love to try, but don't have enough space for 6 tool sheds, lol. Give me some time, I might figure out how to test all these ideas in one or two tool sheds yet. Hey, can anyone tell me if waterglass is suppose to be one word or two? I seem to be finding it both ways. I am guessing it is one word since it represents a compound. I need to get some of this stuff and try it.

Anyone else playing around with **waterglass?** I know we have talked about this off and on, but I do not remember anyone talking about testing various mix ratios. I also do not remember anyone talking about the longevity of the compound in mix or out. I seem to remember it is a **good water proofer** and am wondering now if it is one of the primary ingredients in the various brands of water sealers for wood and other construction materials. If it is, it does not seem to seal as well, or as long as I first thought.
Wayne

From: Keith Britton <brittons@maxinter.net>
Date:2001-03-19

Hi Wayne
I've been fooling with **waterglass** the last couple of weeks. I bought a gallon in '88 and have been using small amounts from it over the years for ceramics stuff. I'd been intending to use most of it this year experimenting with **concrete densification and deep pore sealing** but had to get it out to revive some high temperature cement which was needed for major kiln repairs. I was real unhappy to find that the viscosity seemed much lower than expected, and stirring brought up a heavy deposit from the bottom

which looked like it might be precipitated silica. If you know or pick up anything on shelf life, aging process or tests for concentration, I'm interested. **The Perlite Institute notes perlite/waterglass as a cement,** and it seemed a good time to try that. I dribbled some onto ag. grade perlite and it vanished into the first few granules. Stirring for several minutes seemed to even things out though to a light wetting. I then compressed the mix to form a cake in the bottom of a container. No cohesion in 24 hrs., so I increased the waterglass ration and also the compression. That resulted in weak cohesion after about 48 hrs. That was suficient for use as an insulating refractory filler, so I went on to hot testing. That improved coherence, but with excessive shrinkage followed by softening and incipient melting on white hot edges. I'm not using it for the kiln reconstruction, and I obviuosly need to no more about how perlite/waterglass cement is done. Or, of course, my waterglass is no longer any good...
kb

From: Herbert Crow <wcrow@telepath.com>
Date:2001-03-20
Hey KC,
Hmmm...you got me there KC. I do not know much about **water-glass shelf live** or using it to make perlite-cement. I did find a reference to **it being used with sand to form a mortar for stone.** The same book on Stone Masonry also said it was **used to seal stone**, but still allowed the stone to breath. The author went on to remark ***water-glass helped make the stone resistant to most acids***. I am still a newbie when it comes to water-glass information and use. Have been kicking around the idea of getting some for testing. It does seem to be a sealer that lime mortars will take to well in stone work. I am also starting to think our general thoughts about leaving lime out of a ferro mix might need investigating. Most of the stone work books I have come across use a lot of lime, and less cement for their mortar. If 1 part lime is used with 3 parts sand, the cement is only 3/4 parts. I keep running across folks that use more lime then cement in their ag stone, or other such things. They all report extremely long life, and a slower cure rate. Interesting. Wayne

From: Keith Britton <brittons@maxinter.net>
Date:2001-03-20
Hi Andy,
Waterglass - sodium metasilicate - is made by digesting silica in sodium hydroxide to produce a viscous solution. The prefix meta- is not there in the sense it is used in organic chemistry to signify a very specific structure, but rather because the mix is indefinite or unknown. The effective percentage of sodium silicate can be estimated from the density, but it's always well to think of what you are handling as soluble sand mixed with concentrated lye.
regards
kb

From: Keith Britton <brittons@maxinter.net>
Date:2001-03-26
Richard,
SNIP
My previous experience with it was focussed on producing a material which would work enough like stone for Anna to learn the principles of stone working from an artist mentor without the time and physical impact involved with hard rock. My comments are therefore extrapolations from something other than construction experience. SNIP

With perlite, you buy bulk, fair insulation, some rigidity and a material which seems hypo-allergenic and very durable. It wicks up water **(and syrupy waterglass)** with astounding speed. It's sold to absorb oil and chemical spills, for that property. I doubt you can defeat that while mixing or in your final product. If you just adapt to that, you need to be careful in your designs to keep wall cores dry - notably thinking hard about potential for long distance wicking. Your mixes and cure will have to deal with water in the perlite. It's adsorbed, so it doesn't slop about and has much less effect on your mud than you would think. The salient factors seem to be: You need to allow for the extra mass of the water until drying is advanced, and to avoid sealing it in! Drying is slow, so that affects scheduling. There's a long, damp history, so allow for that in cure - or exploit it. You might find that you can substitute flyash for cement up to 75% to great advantage in strength, cost and waste disposal.

Mehta's flyash work is helpful, see
http://solstice.crest.org/sustainable/greenbuilding-list-archive/9901/msg004 45.html
and the flyash papers in
http://www.buildinggreen.com/features/flyash/
especially his comments on blending and imlications of slow cure in the discussion at http://www.buildinggreen.com/features/flyash/discussion.html
kb

From: Herbert Crow <wcrow@telepath.com>
Date:2001-03-26
So, if I get this, if I should take some lye, in a high concentration and put sand in it, I will get water-glass? I have some sodium hydroxide pellets. I also have some sand. What would you recommend I do to make **water-glass**?
Wayne

From: Keith Britton <brittons@maxinter.net>
Date:2001-03-26
Wayne,

I was inaccurate in a couple of ways, partly sloppy and partly lab background and my line of thought at the time. **The classic route to waterglass actually uses sodium carbonate, washing soda. It's mixed with fuel and sand, burnt real hot, then the residue is dissolved in water.** This goes back to antiquity and is still cheap and suited to bulk production.

Lye, sodium hydroxide, is much more expensive than the carbonate, because of the energy invested in making it. It's more energetic though, so convenient for specialized purposes or small lots. To make waterglass with that, in principle you just mix silica sand into a concentrated solution. In practice, you need to use proper technique or things may go too slowly or far too fast.

You would mix about 15 parts silica with 5 parts lye and 8 parts water. The first move is to dissolve the lye in the water. It generates enough heat to boil and spatter you with material which can very promptly blind you, so you do it a little at a time with pauses to let things cool. An ice bath or a refrigerator helps. You then add the sand similarly, because that can generate heat rapidly too. It can also dissolve so slowly that the effort is pointless, and here lies the big catch. The reaction is limited by the surface area of the silica and you need very fine sand at the least. The modern patents going this route typically are practicable because they exploit the particle size of silica fume. All this needs to be protected from the carbon dioxide in the air at all stages.

I was inaccurate in my mutterings about nomenclature - occaisionally I get annoyed when what should be well defined turns out not to be. **If you have dry Na2SiO3, then it's called sodium meta-silicate. If you hydrate it and crystallize it, it's still dry but with combined/associated water, and is still called meta-silicate. Heat it up to where it melts into its water of crystallization or add water to dissolve it, and the name is suddenly sodium silicate and the formula Na2O.SiO2.n(H2O). This actually makes some technical sense, but if you know that adding sodium oxide, Na2O to water makes lye, then you start thinking lye and sand. And it works that way too. If you expose it to carbon dioxide, you get the result of adding that to lye, namely washing soda, and silica precipitates out. That's probably what happened with my old waterglass stock.**
kb

From: "Martin Iorns" <miorns@att.net>
Date:2002-03-27
The first layer applied to stiffen an airform can be any lightweight material and glue that will set up enough to support a thin layer of mortar into which any type of mesh can be embedded. I have used burlap and it works with a light spray of mortar**. I've been told that perlite with sodium silicate (waterglass) is another option**. Plastic or glass fibers might be used in the initial layer, but I do not recommend steel fibers. The procedure is to work in manageable sections to cover the whole area with only one layer at a time.

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From: radialrafter@willmar.com
Date:2002-07-07
Hi Nolan,
It's worth ordering for me, so I'll send you a copy. Any information on alternatives to waterglass or other preparations they are doing is well worth it.
Alan

> Nolan Scheid wrote:
> >This looks like a great core for a FC building panel. Has anyone on the list read this report? >Is it worth ordering?
> http://www.hdm.lth.se/bi/report/93no2/93no2.htm
> >Take care,
> >Nolan

[Ferro Cement] re. FC chimney and differential thermal expansion
From: Keith B <ferroist@comcast.net>
Date:2003-07-10
Katou,
The differential in thermal expansion between steel and concrete is sosmall that it almost never has to be taken into account. Much moreimportant, for a kiln or a chimney, is the differential in expansionbetween the inside and outside resulting from a hot interior and coldexterior. It is so serious a problem that kilns are made of bricksand chimneys typically lined with space between layers to accomodatethermal movement. That's why you leave a space between the ceramicliners and the supporting brickwork in a conventional masonrychimney.

SNIP

Use your perlite far moreeffectively and simply by pouring it between the liner and the FC as aloose fill. It then insulates efficiently enough to maintain a highliner temperature while protecting the OPC in the FC, is good to anytemperature which will not mess up your steel, and conforms to thermalmotions.
Perlite makes a useful rigid refractory and a mouldable refractorypatching/repair compound using sodium silicate (waterglass) as a binder,but it's soft and the bond develops slowly. You might get by bycasting a perlite cement to shape using a minimum of OPC (between 8:1 and12:1 perlite:OPC by volume depending on the perlite grade) and liberallycoating the inner surface **with sodium silicate** (or silicate/crushedperlite slurry) when it has cured. SNIP
kb

 From: "Rex Tarr" <rex420@hotmail.com>
 Date:2003-09-17
Greenings,
Lately there was a thread of discussion about ***concrete hardening agents***. I recalled a discussion of some months ago regarding **waterglass (sodium silicate solution) used to achieve this**. Today I tried it. And I achieved my first flash set.

I was making some neat cement to fill some cracks on a piece of concrete art I made, and thought, well, why not try that NaSiO2 (jokingly pronounced nazzy-o-2) to see what happens... snip
What I expected, from what I've read:- **hardening- shiny surface- acceleration** So, I made a small amount of neat cement and added about a tablespoon of NaSiO2 (say it), and it's a good thing I was making a small amount in a plastic container, because I got initial set before I could thoroughly complete mixing. I mean, this mix turned to gray gravel in less than ten seconds. I did have initial set, judging by the difficulty of cleaning the container and mixing tool.

Ok, so let's dilute it. **I seem to remember something about "maximum xx percent of mix water or flash set will occur", so I diluted it 1:12 in water; that's about 8 percent. I added this solution to another round of neat cement and it did not flash set. After fixing my art object (a pyramid) I had enough to make one of my typical small batch-sample stepping stones in a bucket. I added some sand, remixed, and vibrated the bubbles out when I had it in the mold.**

I'll let you know how it sets up.
:)Rex

 From: "Rex Tarr" <rex420@hotmail.com>
 Date:2003-09-18
Hi,
I demolded the waterglass-modified steppingstone this morning. It was much harder than I expected (at about 18 hours age). I'm sure that the vibrating helped. So, today I used some waterglass (NaSiO2) in an acrylicized finish coat on a little pyramid. ***It did increase speed of initial set noticeably at about 2%, but not to the point of flash set.*** I plan to increase the dosage a little on my next piece of work. ***The nazzy-O seems to be compatible with the acrylic.***
:) Rex, in rainy central TX

 From: dljohnson123 <dljohnson123@mindspring.com>
 Date:2003-09-28
I've lived with concrete showers a couple of times - 5 mo and 15 mo ***- both times I cleaned with acid when I moved in and coated with waterglass.***

This is long ago when the hardware and auto parts places both stocked waterglass (sodium silicate). Uncoated they are hard to keep clean, ***when coated it's akin to fiberglass in that it will chip if you drop the shampoo bottle*** - oh they are plastic now so that is no worry.

One was in the open - shower head stuck through the wash house wallwith levers to turn the handles inside the wall poked through. In the winter the holes plugged and the head moved to the other side of the wall.
dl

> I'd like to hear about the maintenance issues of cement showers from users who have been living with them for 10 years or more <snip> They say the stains are part of the patina. I can't scrub it> really hard to get the grape juice, baby feces, or iguana turd out of it. Willing to learn,
> Ted

 From: "Rex Tarr" <rex420@hotmail.com>
 Date:2003-10-06
Richard, I'm replying in-FC-stream.
waterglass - confirmed properties:

1. accelerator. Flash set in higher concentrations. Shotcrete users recommend 5-10% max.

2. hardener. Even at 2%. Short term observation.

3. surface glossifier - until recently, waterglass was used commonly as a concrete sealer.

4. plasticizer, at least temporarily and to a minor extent.

suspected properties:
1. release agent? Where used in the mix, there is NaSiO present on the resultant surface. Feels slippery; you can see it. More pronounced with higher %s.I'm shopping for a gallon of it, or five. I wouldn't use it on the inner surface of a watertank, until I know I can get it all off the surface. Also, one might have to wipe it off if it's on the surface between laminations. If I get the time I'll do a small tank with it. I like having a non-chloride accelerator to work with, even with the drawback.
Richard, I'm just about to get to the PVA fibers for a test. Sorry it has taken so long. Have you run them thru a Tirolessa sprayer yet? (I mean the small, short ones)
:)Rex

 From: "Brent" <brentb@pe.net>

Date:2003-10-06
I mixed waterglass with clay a few days ago when I read that this would make rock. It does make a really nice something, wouldn't call it rock. However, it has the same problem as my last experiments, it dissolves in water. A while back I was mixing it with crushed glass for some really interesting looks, seemed great until really wet and then disintegrates.You can buy it by the galllon here:
http://www.chemistrystore.com/sodium_silicate.htm
brent

From: Keith B
Date:2004-04-21

> At 01:56 AM 4/21/04, you wrote:
> >kb, I take it the search for a truly cheap waterproof coating or mortar >using waterglass or the like has not been fruitful? >
> >Just wondering,
> >=Lootvik=

Hi Lootvick
I guess I owe an update on that. The last work reported was on an old patent where doping a viscous waterglass to about 700 ppm was supposed to greatly reduce its viscosity, enabling deep penetration. I reported difficulties when making a concentrate of a few percent solution. The friend I've been working with on that had a stroke at the end of January. That not only stopped work but, one way and another, consumed most of my available time since. I have puttered on with that study though, partly because slow changes were observed and an extended period of observation was indicated.

Over a period of a week or two, the concentrate became very viscous. I eventually gave up on leaving it unmolested so I could use some to make the desired 700 ppm test solution. While homogenizing the vial contents using a glass rod, I discovered that it had not gelled, but appeared to have precipitated silica within the bottom 3/4". I withdrew a sample and diluted it to 700 ppm with stock waterglass. The resulting solution exhibited negligible change in viscosity from the stock, and that did not change with nearly 3 months intermittent observation. SNIP
kb

From: "Rex Tarr"
Date:2004-04-12
Nolan, that's quite an array of the slick stuff!
I use CaCl2 (we pronounce it, "cackle-too") where there's no steel contact. Cheaper.

In the summer we use the natural 100 degree temperature to accelerate most of the work.

I'm being cautious with the nazzy-o (waterglass) until I know more about its traditional use in mortar AND DRAWBACKS (surely there are more than the potential for a slick surface!)... also the sodium METAsilicate I'm using is somewhat vague in exact composition, although I'm staying with the same source for now... not ready for a drum of the stuff just yet. ***After hearing the mine-tunnel shotcrete folks use no more than 5% to 10%, and trying the 'flash set' experiment, I'm happy with results of two to five % in the water. I haven't tried it at 10% of mixwater yet, but it will be a small batch, with everything ready for placement and rapid cleanup, lemmetellya***!..

> ----Original Message Follows----
> From: "Nolan Scheid -Mortarsprayer.com"
> Subject: [Ferro Cement] Sodium silicate vs calcium chloride as an accelerator
> Date: Sat, 10 Apr 2004 16:42:08 -0700
>
> Has anyone done a **comparison of Sodium silicate vs. calcium chloride as an accelerator** in concrete or shotcrete? I have had people tell me to look toward sodium as the right choice. Any input?
> A search on Google gave this supplier:
> http://www.pqcorp.com/productlines/sodiumsilicatespecs.asp
> They have many choices. Which would be best?
> Take care,
> Nolan

From: "Nolan Scheid - mortarsprayer.com"
Date:2004-04-07
Keith just wrote this to me on the Perlite v vermiculite question.
Nolan

> > Hi Nolan,
> >
> > This is offline because posting it to the group brings too much crap to my inbox –
> SNIP
> Both can be used as refractories, but poured vermiculite shrinks annoyingly at an inconveniently low temperature for kilns. ***Perlite can be bonded by waterglass to make a useful refractory for patching kilns to low stoneware temperatures.***
> kb

From: "Rex Tarr"
Date:2004-03-11

HEY ROB! Good to hear from ye.
I'm about to do a shower floor. Any tips you can think of? or even a favorite mix?

I do have a plan, and my mix includes 20% flyash with white portland, INFORCE fiber, ***and waterglass as accel/hardener (service in 2 weeks!).*** It's an overlay to an existing concrete pad. Bonding via polyvinyl acrylic (over the counter bonding agent) mixed with cement (like neat cement, only stickier). SNIP
:)Rex

From: "Rex Tarr"
Date:2004-01-15
Somewhere I have seen a reference to waterglass used with Jute fiber mats in a cement binded matrix. I'm sure of it. So I went (virtually) looking around for it. I found a few surprises.

First, excerpted from:
http://www.rexresearch.com/hhusb/hh11stcr.htm

>
The German company ECCO Gleittechnic Gmbh has developed Iso-Hanf, which is hemp fleece impregnated with sodium silicate and borate for fire resistance. The use of Iso-Hanf to reinforce concrete increases the flexibility by 30%. The drying characteristics and strength of mortar also is improved by Iso-Hanf. The viscosity of paint and its resistance to detergents is increased by Iso-Hanf, and the number of micro-fissures is reduced. ECCO also produces the Setralit product line including several automotive applications for hemp fiber, such as seat covers, brake lining, and insulation.
>>
SNIP
finally, a search on: < "jute fiber" "sodium silicate" > revealed the following post at:
http://www.ferrocement.net/archives/msg05240.html
I should have guessed! I could've just said "site:www.ferrocement.net" in my search criteria and just searched for jute.
Here's the post:
>
To: ferro-users
Subject: [Ferro Cement] prestressed jute fiber reinforcement
From: fractional@willmar.com
Date: Fri, 02 Mar 2001 19:16:09 -0600
Hello again Richard,
Making use of the water content of water glass is the ideal way to **prestress the jute string, or mesh. Dip the fabric or string in sodium silicate and stretch onto forms,** 2x12s filled with strawcrete say. Nail, batten or clamp on to the perimeter and allow to dry before shooting with the tyro. Flip and do other side when dry. Just read a report that sisal at 5% loading (loose, unstressed fiber) did nothing to help or hinder a concrete slab. The gunny sacs I've had of late must be this sisal you mentioned as they fall apart as you look at them. The jute string I am familiar with can hold together an 8" triple break shell about 24" long and send the mortar below grade when shot. No stretch and incredibly strong, but these characteristics will only come out after some tight stringing and a wetting. The pasting and papering wets the strings on an italian can shell with each time it's done. It's just paper and string that keeps getting tighter as the string shrinks, yet it can withstand an 8 oz shot of FF.

Forms will need bucks or the interior contents set first.
Alan
>>

> ----Original Message Follows----
> From: "Chris Glasspool"
> Subject: [Ferro Cement] waterglass
> Date: Thu, 15 Jan 2004 14:10:02 -0800
> ***Another idea about waterglass (sodium silicate) is that maybe if organic components were treated with waterglass, maybe they could be embodied into the mix better;*** treated goat hair for those working with lime putty or treated unsized burlap for armatures. My understanding of ***waterglass is that it essentially fossilizes organic matter hence it is often used for fireproofing!*** I wondered if Michael's reasoning on the pumice might have to do with an insulating factor, if so he might want to look around the web at papercrete, sawcrete and light-cob, maybe these would work well, below, above or in-between the fc.

From: Uwe Brunjes
Date:2004-01-15
Hi Rex et al.,
did you receive my last post before I was "laid off"? There I mentioned oxynitride glass fiber (with up to 4% of oxynitride in the glass). These fibers seem to have extraordinary qualities, but don't seem to be commercially available yet. Something to look out for!
Uwe

> --- Rex Tarr wrote:
> > **Yes, the waterglass does need dilution or it will cause flash set. I'm using 2 to 5 percent and getting satisfactory results: observable early hardening.** At 2% one gallon makes 50 gallons of mixwater, which is pretty economical. The waterglass appears to have a limited plasticizing effect (or is it just my imagination?)
> >

> With **flyash: appears compatible; no observable problems generated**. Time will tell if the goal is achieved: the first part is early hardening (done); the second part is increased ultimate strength (from the flyash).
>
> **With acrylic: waterglass precipates acrylic solids.** I tried mixing a teaspoon of waterglass into a cup of acrylic admix and it caused 'curds' to separate out in the bottom of the cup. I used it anyway in a batch, though, because the curds were quite soft, and indeed were disintegrated upon mixing with binder (white PC 80%, flyash 20) and masonry sand. Results short term: early hardening achieved. Long term: yet to be seen. Because of the accelerant effect, the matrix doesn't have time to experience separation.
>
> **I'm using waterglass as an accelerator where steel is in the matrix,** and where I need to laminate again the next day. I also have calcium chloride accelerator, but I'm saving that now for the ECC-type matrices and nonferrous fibered sprays, due to the risk of chloride degradation of the steel over time. SNIP
>
> The hot weather IS the accelerator when it arrives. I'll still be using acrylic where appropriate as a curing aid. Richard and Keith, I find your contributions of interest and value!
>
> :)Rex

From: "Nolan Scheid" <nolan@clipper.net>
Date:2004-08-18

> on 8/18/04 12:23 PM, Rex Tarr at rex420@hotmail.com wrote:
>
> > (http://www.euclidchemical.com/fileshare/ProductFiles/techdata/TDsureshot.pdf
> >)
> ***the dosage is given as a range varying from 3 to 8 percent by cement weight. Interestingly, it states that overdosing out of this range "may lower ultimate compressive strengths", even though the product is stated to produce "high early and ultimate compressive strengths". So there is the old maxim again, too much can be bad.***

Hi REx, It seems like this waterglass would be good for those making foamed mortar. Spray it in or on and let it cure. Ron

From: Marsha Hedrick <minifairy@netscape.net>
Date:2004-08-18
Along those lines I was thinking if they are adding waterglass at the nozzle couldn't you just follow along behind and spray a coat of waterglass on top of the mortar you have just sprayed? No danger of it clogging up in the sprayer by setting up too soon that way.Just a thought
Marsha

From: "Chris Glasspool" <c.glasspool@verizon.net>
Date:2004-08-18
Commercially produced concrete countertops use the following **proved technique for applying waterglass** and that is to grind the green cement with a diamond pad and this I'm told, "opens the pores", **then waterglass is sprayed** or poured on and pushed around the surface with the edge of a flat steel tool - forcing it into the surface.

From: Keith B
Date:2004-09-10
Hi Brent
SNIP

Regarding mineral paint, thanks for that link. It's a new one on me and the first manufacturer I've seen on this continent. It's what might be classified as the premium type of mineral paint. Keim Paint originated in Germany in the late 1800s. U.S. Patent 595066 of 1897 gives you a good idea of the complexity and work involved in what's certainly the top of the line. When the Keim folks claim their paint lasting more than a century despite intense air pollution, they aren't talking about extrapolations from "accelerated weathering tests", they are referring to things the original inventor painted which still look pristine. The maintenance they suggest is hosing it down every ten years or so.

This British dealer seems to have the best site. http://www.keimpaints.co.uk/ The Aussies seem to like it - much different climate.http://www.spec-net.com.au/keim/
The sole US distributor is here: http://www.keimmineralsystems.com/about.htm
This sequence on their site gives a good overview of the class of paint. Just keep clicking the "Next" button. http://www.keimmineralsystems.com/char1.htm

It should be possible for the amateur to make a cheap but serviceable mineral paint. Look at the patent to appreciate why Keim costs so much. Your link probably gets to much simpler paint, but still paint based on the comparatively costly Potassium waterglass. ***The game with paints of this class is to use a waterglass to position silica in liquid form, then precipitate it out as a very permanent and inert solid. There are reasons why potassium should work better for the vehicle, and it does, but regarding the finished, cured paint, silica's silica. We should be able to make something acceptable using the cheap sodium waterglass, and there's much on how to do that in the old patent literature.***
kb

From: brentb@pe.net
Date:2004-09-09

The Eco-House site gives the ingredients:

Eco-House Silicate Dispersion Paint contains as major ingredients ground lime stone, silicate fillers and mineral- source pigments, such as titanium dioxide, iron oxides and various earthen pigments.

For interior paint:
Ingredients : water, ***potassium silicate***, calcite, chalk, silicate extenders, titanium dioxide, kaolin, pure acrylate dispersion, ammonia solution, polysaccharide, cellulose, sodium-phosphonate, fatty acid defoamer.

For exterior paint:
Ingredients : water, ***potassium silicate***, calcite, chalk, silicate extenders, earthen & mineral pigments depending on colour, kaolin, pure acrylate dispersion, ammonia solution, polysaccharide, cellulose, sodium- phosphonate, fatty acid defoamer, coconut-derived hydrophobing agent

A better url is:
http://www.eco-house.com/index.htm

- *From*: "Chris Glasspool"
- *Date*:2004-12-03

Ted,
SNIP
About countertop finishes: the most natural look is to grind and apply **waterglass(sodium silicate)** to the opened pore slab and repeat again and again using finer and finer diamond pads. - chris
----- Original Message -----
From: "Ted Baumgart"
To:
Sent: Friday, December 03, 2004 8:40 AM
Subject: [Ferro Cement] PVA, Acrly 60

> My wish: I'd just love to be able to use a fiber like PVA and Acryl 60 > together in countertops, along with steel mesh. I'm talking about building > for the ages a waterproof, fireproof, serviceable, non cracking, moldable > material used in food service areas...very specific perimeters.

Loren,
Waterproofing is best achieved by a dense mix (silica fume and/or fly ash/other pozzolan) and lots of fibers for crack-proofing. (Or lots of steel in a ferro design and a small amount of fiber.) If you use a normal gradation of aggregate size, you will have a lot of fines of various sizes. Then you need only add 25% fly ash. Or 5% silica fume. If you can locate fly ash, it should be a lot cheaper than cement. You should use equal amounts of cement and fly ash.

Waterglass, applied in many layers, can work as waterproofing. Xypex is great because it heals cracks.
But most of all use a water to cement ratio of 0.40 or under. Try to stay at 0.35.
Research Peter Epperson's designs. His tanks don't leak.
Richard

waterglass

- *From*: brentb@mybloo.com (Brent)
- *Date*:2005-04-15

hello;
Doesn't simple waterglass waterproof as well as accelerate?
How much do you suppose would get good results?
Thanks;
Brent

IPANEX - Concrete Admixture (type of waterglass?)

- *From*: c.glasspool@verizon.net (Chris Glasspool)
- *Date*:2005-04-16

The question of what about **sodium/potassium silicate** as a admixture. I seem to remember that **it causes a flash set, uncontrollable - useless!** However, a combination of silicates like what is found in this product , reportedly work.Regular, Sodium or Potassium Silicate (Waterglass) are used as part of a grinding and polishing regime used in hardening and stain proofing of concrete countertops. -chris
http://ipanex.com/default.asp

accelerators

- *From*: rex420@hotmail.com (Rex Tarr)
- *Date*:2005-04-22

Hi y'all,
This will be repetitious to some so I'll be brief.
I like waterglass as an accelerator. I use it at 10% of mixwater. 100% will cause FLASH SET which can ruin your mixer (I tried it in a bowl: 3 seconds). **I've read that mine-tunnel shotcreters go as high as 20%.**

Snip

:)Rex

----Original Message Follows----From: Brent Subject:
[Ferro List] Cheap accelerators De: Sat, 16 Apr 2005 17:42:24 -0700
Hello;
Does anyone know of a cheap way to make concrete set up faster? I'm pouring into molds and want to free my molds up as fast as possible. I think using hot water to mix with might help a little.I know when pouring concrete outdoors it will set faster on clear dry days, and even faster with some wind. Maybe I could set up big fans inside my shop. Any easy to get, safe to use, cheap accelerators?
thanks
brent

shower/tub

- *From*: dljohnson123@mindspring.com (dljohnson123)
- *Date*:2005-05-20

I would try the removeable caulk with the tip cut to provide a thick section so that it will pull up. Even the regular acrylic latex can be cut lose with a knife. Another possibility is the line tap that seperates, The tape is scored so that the center pulls out after the tape is put down to make lines on custom car paint**. Fill the center with waterglass so the stain has an edge to cut off at.** Oil will stop waterbase stain and gear lube applies like paint and will go in a year without degreaser. I have not made a design with any of these methods just seen the random interaction over the years.What kind of design did you have in mind? Artwork? Geometric? Tile?
dl

5/20/05 3:12:22 PM, "Janoahsh" wrote:

>Thanks Chris,
>I checked out the site and after signing up for a trial membership I>downloaded all the tips.>I didn't find any specific info on blocking stains from leaching cross>division grooves when different colors are used for different sections so if>you or anyone else has ideas for this I really need the info for this job.
>Thanks again
>Janoahsh.

>----- Original Message -----
>From: "Chris Glasspool"
>Sent: Friday, May 20, 2005 8:45 AM
>> Janoahsh,
>> As far as a vapor barrier goes, I too have gone to extraordinary measures>> for bathrooms in the past. with what I have learned about fc and>> waterproofing, I do wonder how necessary....Still, cheap insurance, I too>> would through in some tar paper at least.>> Here is a link that uncovers more sources and articles on decorative>> concrete effect, than I have seen anywhere. It is a magazine but I believe>> they will let you look at the old archives for a short period of time for>> free. I just received my first magazine and it is definitely for the>> concrete professional. I have posted this before: www.concretedecor.net

Binder for EPS regrind?

- *From*: stevemillward@warpmail.net (Steve Millward)
- *Date*:2005-05-23

Hey Peter, I think I read somewhere that someone used sodium silicate (waterglass?) as a binder for eps. Also, I understand they make a glue from PVA powder. Of course, I don't know how cost effective either one would be. (Let me know if you try it).
Cheers,
Steve Millward

On May 23, 2005, at 6:03 PM, Lloyd Turner wrote:
> Peter,
>> White glue might work. Thin to taste. Wet EPS regrind, shoot in > place. Let dry. Easy.
Snip
> Lloyd
>
> On May 23, 2005, at 2:17 PM, PeterPayne wrote:
>
> Hi folks,
> As I have a source of fairly cheap EPS regrind, which i will use in > EPScrete, I was also wondering about using it as a purely insulating > material in places where I don't need any structural strength. I > imagine any cement matrix will reduce its insulating value; anyone got > any idea what I could use as a binder for the regrind which would > interfere as little as possible with insulation?
> Thanks!
> Peter

Re: Sorel's cement and PVA and Steve's comments

From:tfe@sover.net
Date:2005-07-14
Jon--
Sodium silicate: also called Liquid Glass, Waterglass. Traditionally used for preserving eggs--binds with the calcium in the shell to form an impervious coating. Fully soluble in water; though i have an idea that at higher temperatures it crystallizes out.

In the Grancrete mix, the chemical reactions produce a silicon compound thaT ACTS AS A glass-like or ceramic-like BINDER, JOINING ALL THE COMPONENTS INTOA SINGLE NON-POROUS MASS. (oops, sorry!). The cost of the components is such that it could not compete with Portland on its own territory, but might have properties (toughness, tensile strength, impermeability) that make it appropriate in certain application--perhaps especially those requiring a balance of tensile and compressive strength, like thin-shell applications). As to the white mass in the bottom of the jar--have you tried re-dissolving it? But I should think it won't. **One thing sodium silicate does readily is to combine with whatever other minerals are around to form silicates of those minerals**. i remember as a child I put crystals of copper, zinc, other minerals , in a jar of Waterglass and watched over a week or two as it formed amazing complex crystal growths of silica salts, looking like weird underwater plants! So maybe what you are seeing there is a bunch of different silicon compounds formed around bits of dust etc.

I know Herb Nordmeyer thinks very highly of sodium silicate, but I have yet to ask him why.
Peter

----- Original Message -----
From: "Richard McCabe"
To: "Jon Sherbeck" ; "Ferrocement Discussion List"
Subject: Re: [Ferro List] Re: Sorel's cement and PVA and Steve's comments
> From: "Jon Sherbeck"
> To: "Ferrocement Discussion List"
> Sent: Wednesday, July 13, 2005 10:24 PM
> Subject: Re: [Ferro List] Re: Sorel's cement
>
> > > Peter,
> Would you think the sodium silicate sparsely soluable? I have a gallon plastic jar of it that after years of sitting around has a white solid mass in the bottom 2/3 and water on top. I always thought it was water soluable. I have forgoten what we were using it for but it was no longer of use and I took it home from work rather than throw it out. I remember it was vacuum impregnated into porous aluminum engine cases to seal them.
> >
> **Sodium silicate is cool stuff. Try mixing some into a very small bucket of > concrete. It will set in seconds. (Use it sparingly as an accelerator.) > Applied after the fact, it seals the surface.** As to the specifics of otheer > uses/purposes, I will leave that to those more knowledgable.
> >

CaCl2 and NaSiO
From:rex420@hotmail.com
Date:2005-08-21
Hi Jano, I just got back on the list a week ago.
I'm using waterglass whenever I need an accelerator. I use it as 10% of mixwater. It appears to be compatible with acrylics (resultant curdling is dispersed by mixing) and with SP (I'm currently using Rheobuild 1000). Results are usually pretty obvious, with 2-day hardness at about 12 hours. Remember that this can cause you to have to reschedule any initial-set-stage carving/tooling.

I'm not using much of it right now, because days are around 100 degrees F here this month. snip

I don't use CaCl2 wherever steel is present. That is its only serious drawback for FC. I THINK it is OK to use with PVA but this should be doublechecked before attempting. That would save $$!!
:) Rex

----- Original Message -----From: "Janoahsh"
Sent: Saturday, August 20, 2005 12:49 AM
Subject: Re: [Ferro Cement] CaCl2 and NaSiO
> Hi Rex, > I was wondering how your experience with sodium silicates is going. Have > you tried it with little or no cement? Can you tell me what the chemical > action is? Can anyone?? > I am having difficulty researching it. > Janoahsh

sodium silicate
From:rex420@hotmail.com
Date:2005-08-23
Hi Jano,
I suspect that NaSiO does indeed react with other binder agents, but I haven't researched this in detail. **Waterglass hardens with heat**; I've heard of it being used with perlite to make a non-structural solid matrix for high temperature (refractory) applications; also I think it has been used with heat resistant fiberglass gauze to repair tailpipes/mufflers on cars.

There are a LOT of articles out there if you search on **"sodium silicate"** -- I suggest adding other search terms, as there are so many. I got 12,100 hits from 'waterglass' and 'cement'.

:) Rex

Date: Mon, 22 Aug 2005 00:49:36 -0800 From: "Janoahsh"
Subject: Re: [Ferro List] CaCl2 and NaSiO Hi Rex,
I get the impression that sodium silicate acts as a pozzelon forming molecular bonds with other aggregates as well as cement or Portland. Is this not true? Janoahsh

Waterproofing, SIlicates, Carbon fiber mesh

- *From*:tfe@sover.net
- *Date*:2005-08-30

Hi All,
Wanted to share some stuff I've been learning.

Several products (Ashford's Formula, Sodium Metasilicate (Waterglass), Xypex, ?Tegraproof) (surface application) are largely soluble silicates which penetrate into the pores of concrete and mortar, bonding with the cement and forming silicate crystals, thus waterproofing, densifying, increasing compressive strength, improving curing, increasing chemical resistance and freeze-thaw resistance, and increasing surface abrasion resistance--a nice set of effects!

In researching these, I came across 2 products which deserve special mention: first, Protecrete. They offer independent studies to show that their formula (which they describe as a catalyst-based silicate formulation) penetrates much deeper into the concrete than sodium silicate-based formulas, and significantly densifies the material. But what seemed best to me is **Aquron 2000** http://www.aquron.com/ (mentioned in this list by Loren as his favorite. It seems to be about half the price of Protecrete. It claims to be the only such formula which does not crystallize, but form a silica gel which remains amorphous (and thus functional) indefinitely. They offer what appear to be several independent studies showing that it outperforms several other products, including Xypex specifically, which they claim ceases to be functional after a time period. **They have some detailed scientific explanations of the effects, including a 25% increase compressive strength after 7 days; increased cement paste formation; total waterproofing even against hydrostatic pressure from the "wrong" side; binding of free water so that even with relatively high water ratio the cement does not weaken; no need for conventional curing methods; and that it binds free alkali (thus, I imagine, making it possible to use regular fiberglass reinforcement instead of the AR).** Costs about $40/gal, which covers about 200 sg ft. They also have a formula that you mix with the mix water before adding to the mortar. I think this would be preferable for thin-shell use. 10 oz/100 lb cement; $40/gal. Not bad, considering all the benefits!

Also found C-grid, http://www.techfabllc.com/C-Grids.htm a reinforcing mesh made of carbon fiber and epoxy. Very strong, very light, easy to handle and cut, available in wide range of mesh sizes, doesn't corrode; bends very easily in single curvature, but fairly rigid--hard to say how much double curvature you could get. Probably enough for a 10-ft dome?? Haven't found the price, but they are promoting it as an alternative to steel mesh. 10 x the strength of steel by weight.

Peter

Waterproofing, SIlicates, Carbon fiber mesh

- *From*:hoh@montrose.net
- *Date*:2005-08-30

Hi Peter,

The current issue of Concrete Decor has an article or advert. about a material that seems to be similar to the Aquron 2000. It claims to densify concrete by binding with the free lime leftover after curing of concrete. I don't have the info in front of me at the moment but I'll attempt to put it up tomorrow.

I've been in touch with the techfab people for a couple of months now regarding their C-grid material. This stuff looks to have a great deal of potential and indeed has already been used in retrofitting concrete and I believe wooden structures when used in combination with mortar. I think it may prove very useful in combination with steel wire mesh of 6x6x10x10 size, welded fencing wire with 1'x2' openings and welded wire square meshes of say 1" openings.

They are definitely looking for new uses for their material, especially in the FC field.

I brought some samples to ITSA but I didn't get the opportunity to talk about it due to time constraints.

My contact there is Gregg Blaszak so you may want to contact him for samples. Be sure and tell him I referred you to him.

thanks,
Paul

Waterproofing, SIlicates, Carbon fiber mesh

- *From*:tfe@sover.net
- *Date*:2005-08-31

Hi Paul,

Thanks for the info. I just got my copy of Concrete Decor, and it is an article about exactly that stuff--although they don't mention any products by name. **I'm sure Protecrete and Aquron are the kind of stuff they mean,** and I'm sold on Aquoron. I'm just about to order a 5-gal pail each of the spray-on, the admixture, and their elastomeric coating (mutiple redundancy for earth-sheltered!).

Strangely in the article they don't mention what to me is one of the most important aspects--curing. Since good curing conditions are tricky, especially for thinshell which dries out quickly and is hard to cover, and admixture which prevents water loss and enables (according to them) perfect curing without protection, is invaluable! I did notice in the article that they say it increases tensile strength too.

snip
Best
Peter

sodium silicate foams

- *From*:ferroist@comcast.net
- *Date*:2005-11-20

Hi Alan (and others)
Re. Edison Foamed Cement: Of several web references, this gives a good overview of Edison's cement activities
http://www.worldwideschool.org/library/books/hst/biography/Edison/chap20.html
Reportedly, he had about 40 of 1,000 odd patents in that area, most notably pioneering the long rotary kiln. Patents are listed here
http://www.worldwideschool.org/library/books/hst/biography/Edison/chap50.html
and I don't see anything on foamed cement. Almost all the cement ones seem to relate to making it, but he had begun to innovate in areas of more interest to us when his interest shifted to applications, see the 1908 patent titles.

Re. your questions 1-4: I haven't looked into (1) yet. (2) I was
deeply suspicious of .029 when I first saw it. That's about 3 times better than expanded polyurethane and silica aerogel, 8 times better than eps at 1-2 lb/cu ft. Hmmm... It might be valid for insulation in vacuum... For those who don't know of it, the NIST database on observed thermal properties is useful and here
http://srdata.nist.gov/insulation/insul_search_menu_12.asp
(You don't have to enter data in all boxes, default values are there but hidden. At a minimum, select units at the top right, click the down arrow at the end of the materials box and select from the drop down menu. Click start search to see a results list. If you click the ID on the right, you get that test summary.)

Re. (3) & (4): 30 to 100 expansion reads to me as large volume increase implying resulting foam densities of the order of 3-1% of the original. 9 lb/cuft is the right order for a 3-5 fold expansion. If around 50 psi is fair for that, the compressive strength for the much lower density material can be expected to be very small. It's not the density of the original which determines but the way it's expanded. Bear in mind the generic formula **NaO.xSiO2.yH2O -** where x and y give often fractional proportions of silicon dioxide and water respectively. Density reflects not only concentration but the chemical makeup of the particular formulation. Buy "waterglass", or read papers/patents etc using it, and if you get no more information, you don't know what is involved. It's about like seeing "truck" and not knowing whether it's an 18 wheeler, a panel, a dump or, for that matter, one end of what a rail car rides on... (Remember this when someone blithely speaks of 2% silicate in a mix.) I don't know but doubt all mixtures can be dried and redissolved. Some **sodium silicate** is available dry, hard to package it in a mortar or grout mix if it isn't, **but it is known for being a pain to dissolve in bulk**, so almost all is supplied as solution for industrial use. I don't think hygroscopy is the problem with powder, but think about the formula. NaO.xSiO2 isn't just empirical. **Waterglass can be looked at as a neutral compound of an acid oxide and a basic oxide,** but one has to remember how reactive sodium oxide is. Offer it carbon dioxide as an alternative to silicon, and it's liable to become a carbonate and pitch out solid silicon dioxide. If there's excess of the latter, other things can destabilize waterglass to precipitate SiO2, a good example being coacervant doing that to thin coat lenses.
kb

twobends at charter.net wrote:

> >Hi Keith,
> >
> > After reading that article Marc found I have a few questions:
> >1. What type of acid exposure would it take to make it insoluable yet safe for >habitation?
> >
> >2. I'm lost in a sea of heat tranfer specs, how does .029 BTU/hr-ft^2-degF compare >to other foamed cementous products or EPS board stock? This was the spec >obtained from the first chart in relation to foamed anhydrous sodium silicate that >was disolved in 15% H2O and heat foamed.
> >
> >3. This last instance was claimed to obtain 30 to 100 expansion. Is that 30x to >100x, or roughly only a 3x expansion. Is this of the raw dry substance or the wet >mix? It left me wondering.
> >
> >4. He claims a 9 lb/cuft result elsewhere, which was considered the result of a 3x to >5x expansion. I presume it would be due to the density of the solution you ordered. >Is it practical to order the the **anhydrous powder** and just add your own water to >save on shipping? In looking for it in the past I found the liquid version readily >advertised in Thomas Register. Is it too hydroscopic to obtain and store in the dry >state? Just trying to get close to the 3c/lb barrier! Thats more like it.
> >
> >Thanks,
> >>Alan