

Casting Artificial Granite The Ancient Way

New Feature: Using Nubs for Draining Excess Liquid

Document version: v3.0

Main changes compared to V2.0 series: it's a **radical simplification!**

- No water added
- No mixing while casting
- No scale used
- Nubs used to get rid of the excess liquid

Shortcut for v2.6 users: <https://youtu.be/HTuMK70wxJ8>

Here are all the secrets for you:

Secret number one: the secret material is just a pinch of slaked lime, also called calcium hydroxide, $\text{Ca}(\text{OH})_2$, in a minuscule amount (2%), as a catalyst only, to start gelation¹.

Secret number two: no mixing while casting. It works best with the right mixing technology, which is actually non-mixing while casting. If you just try it with your 21st century mindset, mixing like a maniac or using a machine, you'll certainly fail².

Secret number three (advanced level): no measuring: Although I give you exact grams here, this is because you are a beginner with a 21st century mindset. You'll soon see and feel this precision measuring is unnecessary. Like mixing: no need.

Why is slaked lime counterintuitive in this mix?

Here's the thing: although any acid will precipitate silica gel from waterglass (like lemon juice etc.), but ffs, slaked lime is just the opposite, a strong base! An alkali, which does nothing with waterglass – in theory. And without the right mixing (actually: non-mixing) technique, it surely will not.

On top of that:

- Its color: everything you make from/with lime turns out to be white. At first it looks like this again, but in the end our binder becomes completely transparent.

¹ On its own, without a catalyst, waterglass doesn't really do anything—it won't gel, it just stays liquid for weeks and then slowly dries out. Even if I mix it with stone rubble. The waterglass just seeps right out of it.

² Mixing it just lets the little bits of slaked lime meet each other and clump up into nice visible white lumps. But when that happens, we lose our catalyst, and the gel formation either won't start at all or kicks in painfully slowly.

- Lime and limestone are on a completely different branch of stones (than granite), mixing the two is “dumb and ignorant”.
- Slaked lime is not soluble in waterglass. If you drop your slaked lime into waterglass, you’ll see it’s not working. The result is a big nothing (lumps of lime at best). You can try it if you don’t believe me, just don’t waste too much waterglass for that.

(And NO, it does NOT turn the material to concrete or CSH (Calcium Silicate Hidrate) because the amount of slaked lime used is 10% of what would actually be needed for CSH. 10X!)

1. Ingredients

- A bottle of waterglass (Na_2SiO_3) (we don’t measure it in V3 anymore). Maximum density: 40%. Watch this short video how to test waterglass gelation and what to know about different waterglass types: <https://youtu.be/7ZJUO6isaNs>
- For beginners:
 - 2 grams of slaked lime ($\text{Ca}(\text{OH})_2$)
 - 100 grams of sand (or other silica based crushed stone)
- For seasonal Secret Masons:
 - Add enough lime to the sand/granite grains so that the white color is clearly visible.
 - There you go—that’s “exactly” 2% slaked lime.

Shopping list at the bottom of this doc.

2. The chemical mechanism behind

Here's what happens in the background: the calcium ions coming from the slaked lime destabilize the waterglass solution, causing amorphous silica gel to precipitate, which is our transparent binder.

Amorphous silica = a type of glass. Our artificial stone will be a glass-based material.

Our job is to distribute these “destabilizing agents”—that is, the slaked lime particles—as evenly as possible throughout the material, so they can “sabotage” the waterglass uniformly.

That's why we're going to mix the dry slaked lime thoroughly with the dry sand first – essentially grinding down the lime particles and distributing them evenly between and around every single sand grain.

Since this uniform distribution is achieved completely in the dry state, no further mixing will be needed later. (And TADAAAAAM, this is the way Roman concrete was used underwater! Did they inherit this knowledge from the distant past?)

3. (Non-) measuring the ancient way

As you gradually add the dry slaked lime to the dry sand, the moment you start seeing a white tint appear, that's roughly 1% slaked lime. I'm not kidding, that's just 1% by weight, although it seems much more. Slaked lime is a very fluffy, lightweight powder.

Then add a bit more until the mix is noticeably whiter than the original sand. When the dry mixture already looks nicely whitish, that's approximately 2% slaked lime. Like this (shot with flash – it's actually a little less white in normal lighting):



From left to right: original silica sand, then 1% and 2% slaked lime mixed in

Of course, this is only an approximation, but once we put it into the waterglass, you will see immediately whether there's enough slaked lime in it: if you drop in a spoonful and the sand slowly sinks to the bottom grain by grain, not forming a lump, it's not enough. If it clumps together into a ball (because the gelling starts immediately on the surface) or it floats like a little boat, then it's okay.

4. The Process

Now you have the pre-mixed dry, white-ish, 2% Ca(OH)₂ sand or granite grains you can start casting an object.

IMPORTANT!

The actual casting should be done entirely **under the liquid surface** so that no air bubbles remain in the finished material.

So pour “some” waterglass into a mold, like 1 cm deep. Now put your pre-mixed dry sand-slaked lime mix spoon by spoon into the waterglass and push it down. Crush lumps gently. Do not mix, just push it down and gently crush it if needed. (You can see in the first video above how I do it.)

MIXING IS BAD! Mixing develops both bubbles and visible slaked lime lumps!

As you proceed and gradually add the pre-mixed sand, keep topping up the waterglass level so that we always stay under the liquid surface.

5. The Nub Phase

When you finish, wait an hour and then cut a hole at the bottom of your mold and find a good place to let the excess waterglass come out. I've found it most convenient to set the bottom-cut plastic cup—with all the goo inside it—into a clear glass. The rim catches and holds it in place, and then I can easily watch the dripping through the side of the glass.

If you can't cut the mold, then the second best option is to pour down the excess liquid from the cast stone. The stone will keep its shape already. If it doesn't hold its shape, there isn't enough slaked lime in it. Wait a little longer.

6. Safety measures

We are mixing alkaline materials at room temperature. No security risk under normal conditions. Touching it can be irritative to the skin, so don't touch it, or if you do, wash your fingers immediately. Wearing rubber gloves is recommended but frankly, optional.

Now let's see the ingredients one by one:

1. Waterglass or sodium silicate or Na₂SiO₃

Surprisingly waterglass is also a food additive under the code **E550** (anti caking agent). You can check this fact on the link below. So, you are actually EATING IT within pudding, for example, in minuscule quantities. With that said, don't drink it from the bottle, that's stupid :)

<https://www.food-info.net/uk/e/e550.htm>

There is also waterglass added to DRINKING WATER because it collects floating contamination and settles down. This is Google's AI answer:

"Sodium silicate is intentionally added to tap water by water treatment facilities as a chemical to prevent corrosion, sequester iron and manganese, and act as a coagulant aid. It forms a protective film on the inside of pipes, which helps prevent the release of lead and other metals. Naturally occurring silica is also found in all tap water, originating from the earth."

So waterglass is non toxic, not more than table salt. Although you can kill yourself with salt overdose, it's a dumb thing to do and doesn't happen by mistake. Same with waterglass.

2. Slaked lime or calcium hydroxide or Ca(OH)₂

Slaked lime is/was wall painting material for thousands of years, also non toxic by nature, but hey, it's a stronger alkali. It's a fine powder so there is a tiny risk of inhaling it. Don't do that. If you inadvertently drop the box, and a cloud of slaked lime forms in the room, just leave the room, let it settle, grab a vacuum cleaner and go back with that weapon.

3. Sand

I'm not aware of any possible lethal accidents with 100 grams of sand.

Summary: under normal household conditions, none of these ingredients are dangerous, but basic common sense applies. Avoid eating or inhaling them, wash your hands, and don't pour chemicals, sand or - God forbid- artificial stone into the sink. That would be a cast sink – or a sink cost 😊

7. A caveman trick

A practical advice, a **caveman trick** about how to tell if your stone still contains water, without any device or a scale?

Just touch it. If it feels cold, that means that evaporation is taking place, and that cools down the surface. That's it. Touch it every day, and after 3-4 weeks it will not be cold anymore.

8. One last thing

You are working with sodium waterglass (most likely), so you are creating an indoor version of fake granite. It will be waterproof for hours, but you can't use it as an aquarium decoration because of the bloody sodium in the mix.

To make it 100% waterproof you need to either use potassium waterglass or to use some kind of coating on the stone as the Egyptians did in the caves of Serapeum³.

Shopping list

I recommend you buy the smallest amount possible because it's close to 100% that your first casting will be far from optimal (=shit). Do NOT start with casting a 100 ton obelisk first!

Also, I didn't buy these exact materials from the USA – living in Hungary. I found these good candidates by the description only. I used local ingredients for obvious reasons.

Material	One potential source
Waterglass, also called sodium silicate solution, Na ₂ SiO ₃	https://chemistrystore.com/product.cgi?product=17828 You can buy waterglass in paint stores where they are selling painting tools like brushes.
Slaked lime, calcium hydroxide, Ca(OH) ₂	https://www.laballey.com/products/calcium-hydroxide-powder-acs?variant=7218967281723 (500 g is more than enough) Slaked lime is sold in gardening shops in small quantities for soil treatment.
Silica sand	https://www.syntheticgrassstore.com/silica-sand-sgs-brand-100lb-bag.html Silica sand is sold in 20 kg bags cheap where pavement stones are sold. It's the filler they use between the stones.

Plan B: you can walk into any big hardware store and buy all of them in one go without waiting for delivery from thousands of miles away. That's the boomer way to do it 😊

³ There's a visible coating on the giant granite boxes. My bet: it's a layer of potassium waterglass.