

WSA Material Matters



What is Plaster?

The chances are, if you are sat in a room right now you are completely surrounded by it - but what is plaster?

Plaster is a processed gypsum mineral, which in its pure natural form is called selenite. The name selenite is derived from the Ancient Greek goddess Selene, the goddess of the Moon, which quite accurately describes the beautiful moon like quality of the mineral.

Let's start by looking at how the mineral naturally forms - as it really helps to understand what the material is and how it functions.

A Crystalline Structure



The photo above is of a rare example of selenite crystals which have formed to a colossal size, yep those guys in orange are really there! Incidentally the pure gypsum form selenite is a fibre-optic material - meaning because of how the crystals are aligned light is transmitted through them, the same way in which information is transmitted via fibre-optic cables bringing us high speed broadband.

Raw gypsum, like in the photo below, is mined in large quarry's, its highly abundant and is found everywhere around the globe. They have even identified large dunes on the surface of Mars, so when SpaceX sends their first colonies there they will be able to make the first Martian plaster sculptures.

But how does this strange mineral become the plaster in the bags that we use for sculpture - or indeed any other of its far reaching applications?



The process is quite simple; the gypsum is mined, then crushed, ground and heated to around 150 degrees C - the resulting product is the fine dusty powder that we know.

The science, for those interested is as follows; gypsum is formed of calcium sulphate and water, this is calcium sulphate dihydrate, meaning there are two molecules of water for each of the chalky like calcium sulphate ones. When this is heated around 75% of the water is separated from the calcium sulphate in a process called calcification - producing calcium sulphate hemihydrate, which is our ready to use powdered plaster.

When we use the plaster powder, mixing it with water, we are simply adding back the water that was taken away, reforming the gypsums crystalline structure. If indeed you were so inclined and had a lot of patience, you could recycle your plaster infinitely, by repeating the process of crushing and heating - returning it to its dehydrated powder form.

Ancient and New

Plaster has been used since ancient times, the insides of the Great Pyramid in Giza are decorated in it, the same as your living room. One of the biggest changes in domestic use came in 1894 when Augustine Sackett figured out how to create a sandwich of card and plaster - making plasterboard, a fast and labour saving way of coating walls, which has also resulted in saving many lives through its fire retarding capabilities.



As we know plaster is not just for covering the insides of buildings in and has a multitude of different uses.

Plaster is used within many different Fine Art disciplines:

- It is used in several applications for creating painting grounds; for frescos, as well as mixing gesso priming layers.
- Plaster moulds allowed the production of ceramics to go big, with the use of slip moulds letting ceramicists produce multiples of their work.
- Surprisingly plaster is key to traditional stone carving, with many traditional stone carvers using pointing machines to copy plaster models.



- Plaster is used in 3D digital prototyping printers, producing physical realisations from a digital world.

Sculpture, is of course the place we most frequently encounter plaster. It is used in the making of most types of moulds as well as in the production of finished works.

But plaster also inhabits an intermediary and unfinished capacity - traditionally seen as a material not to be used in finished works, it always retains a “studio” quality.

Plaster however, can and is widely used for finished pieces, it has a simple honest beauty, catching the light in a special manner, allowing gestural process-based making as well as fine detailed casts.



Pros and Cons

Plaster like many mediums has its advantages and disadvantages. Kept inside under good conditions and it can last a millennia, left outside in the rain and it damages in under a month.

It is versatile - can be poured as a liquid, or if you wait a little longer is pliable like clay for a short time, before becoming hard enough to chisel away at. However it always remains fragile to a certain extent, vulnerable to chips and cracks if handled roughly.

You can make something temporary more permanent by taking moulds from clay and wax sculptures and casting it to plaster. Most importantly it is cheap, coming usually in 25kg bags, readily available in nearly all countries and once you have the hang of the basics, it is fast and easy to work with.

Plaster comes in many different hardnesses depending on how it is processed and if extra things are added to it, in general though there are two categories; Alpha and Beta. Alpha plasters are harder, good for casting with and have a shorter workable time. Beta plasters are softer, better for sculpting with and have a longer working time.

You hear plaster called lots of different names, usually these are commercial product names like herculite or fine casting plaster for example. In other countries it may be called simply some variation of gypsum like “gips”. We have all heard of “Plaster of Paris” - this is just plaster like any other, the term became widely used, as the first commercial quarry for gypsum just so happened to be in Paris.

How do I mix it?

Use a clean bucket and fill it no more than half full with clean water. If you fill it more than half full you might find you don't have enough room to put all the plaster in you need to.

Feel the plaster in your hands, it should be flour like and free of hard lumps - small lumps means the plaster has been exposed to moisture and has been spoilt, this is called dead plaster, don't use this plaster as its strength and properties are often severely compromised.

Sift the plaster into the water through your fingers allowing it to settle and sink into the water (don't stir the water at all, we do that right at the end). Keep adding plaster in this manner until a small island of plaster is formed on the surface of the water, which doesn't sink. This means the water has absorbed as much plaster as it can and the correct ratio for maximum strength has been achieved (this is roughly 1 part water to 1.5 parts plaster by weight).

Next just let it sit for two minutes, this is called soaking. Soaking plaster allows more of the plaster to become correctly hydrated, it will decrease the bubbles you will get if you are doing a cast and also will improve the strength of your plaster.

Now we stir the plaster, this can be done by hand, feeling for any lumps that need mixing in, this should be done until the plaster is smooth and creamy. You can wear gloves to mix

plaster, or you can have a bucket of clean water next to you to rinse your hands. Try not to let the plaster dry on your hands as this after time can make your hands sore and is much harder to clean off.

However **never** put your hand in a pot of plaster and leave it in - letting the plaster set.

When plaster hardens it produces heat through a chemical reaction (exothermic reaction) if you hand is trapped in plaster you will get severe burns.

Now we have our mixed plaster you can pour it into a mould or sculpt away with it when its harder. But how long until it's gone hard? Usually at room temperature it will be hard in 45mins. Colder temperatures will make it set slower and warmer faster.

If you want it to set faster than this, you can use warm water, and allow the plaster to soak a couple of minutes more. You can get the set time down to about 25 mins doing this.

Still impatient? You can get it down to 15 mins by following the 25 min guidance above and adding something extra. If you have some dry set plaster to hand, you can grate some of this into a powder and add it at around 1% to the water before mixing the plaster. This acts as an accelerant - when the crystallisation is occurring the new plaster has some old to copy the structure of making to go hard faster.

You can check if plaster is set by seeing if your fingernail leaves a mark on the plaster, you should be able to only just mark it with your nail.

When plaster is dry you can seal it, paint it, stain it, amongst a multitude of other ways to change the surface - or just leave it as it is.

Winchester School of Art, 2020, David Teager-Portman.

Image sources (in order of appearance):

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