

Biocomposite (food waste)

A tough but light, textured bioplastic. Remains some flexibility when cast as a sheet. Gelatine-based with dried and ground eggshells/pistachio shells as filler to avoid shrinkage. This resin is dense and rather heavy, but not rock hard like synthetic epoxy or cold like glass. It keeps certain level of bounciness to it.

RECIPE

Ingredients

1. Gelatine powder - 24 gr
Functions as the polymeer (so it becomes a solid)
2. Glycerine - 18 gr
Functions as plasticizer that bonds with the gelatine (makes it flexible).
3. Water - 200 ml/gr
To dissolve and mix the polymer and plasticizer
4. Dried and ground egg shells - 55 g
Used as a filler that reduces shrinkage, and simultaneously adds texture and strength.

Tools

- Cooker or stove (optional: temperature controlled)
- Pot
- Scale
- Moulds (acrylic or glass surface to cast sheets on, silicon molds for solids. Molds with removable base are very useful).
- Spoon

Variations

- Add a natural colorant such as a vegetable dye or water-based ink (e.g. hibiscus, beetroot, madder)
- Add more glycerine for a more flexible material
- Use a different kind of filler than egg shells. Think of any dry fibre made of biomass (e.g. dried plant leaves, dried used coffee grounds, shredded paper waste)



Method

1. Preparation

- Prepare the egg shell powder if you don't have it already: clean the egg shells and dry them at 100 degrees celcius for an hour in the oven. Grind into a fine powder with a blender.
- Weigh your ingredients
- Prepare the mold and find a place where you can leave it for a while, ideally near an open window where there's air flow.

2. Mixing and dissolving the ingredients

- bring the water to the boil
- optional: add natural dye if you wish to use color
- add the glycerine
- add the gelatine
- Keep the temperature below 80 degrees celcius while stirring *very very slowly and gently* to avoid making bubbles. I prefer a simple spoon to do this, not a whisk.

3. Cooking the ingredients

- Simmer and slowly stir the mixture between 60-80 degrees celcius for at least 20 minutes. Turn it lower when bubbles appear: you don't want the liquid to move, don't boil it. This sample has some bubbles due to vigorous mixing.
- Longer cooking time allows more water to evaporate. You will get a thicker liquid to cast with, and less shrinkage of the cast object. To cast larger volumes and solids with this recipe, evaporate a lot of water, until it's very thick.

4. Casting

- Stir in the egg shell powder, slowly stir until the liquid gels a little. If it's very liquid the powder will sink to the bottom of the mold.
- Cast into the mould(s) slowly to avoid bubbles. Pour from the middle and hold still, let the liquid distribute itself.
- Put the mould away to dry in a cool place with lots of air flow (like near an open window). A warmer place might speed up the drying process but also allow bacteria to grow faster and can result in fungal growth.
- If the mould has a removable base, remove it after 4-8 hours and put the mould on its side to allow air flow from both sides.
- The compound will shrink a little. Press it under a stack of heavy books for a few hours and then dry for a few hours again, alternating the two. If you can dry the cast objects on a roster while pressed that is ideal.



A recipe from:
<https://class.textile-academy.org/2020/loes.bogers/files/recipes/biolino/>

Drying/curing/growth process

- Mold depth: 3 cm (filled up until 2.5cm high), or cast on a sheet (3-5mm)
- Shrinkage thickness: 10-15 %
- Shrinkage width/length: 10-15 %

Shrinkage and deformation control

Letting it dry up to ten days to get to the final form. Flat sheets will remain somewhat flexible.

Curing agents and release agents

None.

Minimum wait time before releasing from mold

4 to 8 hours

Post-processing

Cut the sheet into shape or trim the edges before it is completely dry and hard.

Store in a dry and ventilated room.

Further research needed on drying/curing/growth?

It's worth trying to evaporate as much water as possible to reduce shrinkage even more. Adding the powder will thicken the liquid too so try to find the sweet spot where you can still pour it.

