

# Bioplastic (starch-based)

A rubbery bioplastic based on gelatin and cornstarch. This slab feels a bit like a rubber. It's strong but flexible and is less stiff than the gelatine-based biosilicon for example. It has a sour smell from the vinegar, which slowly fades but does not disappear completely.

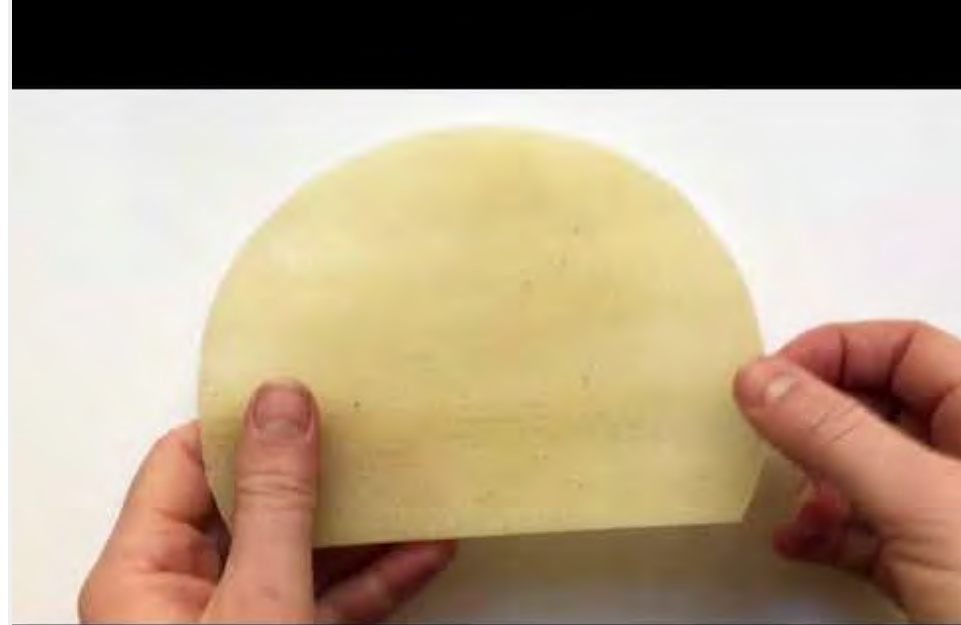
# RECIPE

## Ingredients

1. Gelatine powder - 50 g  
Functions as the polymeer (so it becomes a solid)
2. Corn starch - 50 g  
Functions as the second polymeer (so it becomes a solid)
3. Glycerine - 100 g  
Functions as plasticizer (makes it flexible).
4. Water - 100 ml/g and a dash extra  
To dissolve and mix the polymer and plasticizer  
To dissolve and mix the cornstarch before adding to the other liquid
5. White vinegar - 15 ml/g  
Vinegar is almost always added to starch-based biopolymers to change the molecular structure of the starch, making it stronger and more workable. It helps to disrupt the molecules further, resulting in a homogenous bioplastic.

## Tools

- Cooker or stove (optional: temperature controlled)
- Pot, scale, spoon
- Sheet of textured plastic for casting
- Strip of acrylic (or spatula for even spreading)
- A press or a stack of heavy books (to keep the slab pressed while drying)



## Variations

- Add a **natural colorant** such as a vegetable dye or water-based ink (e.g. hibiscus, beetroot, madder). The vinegar makes this recipe acidic so keep that in mind when using PH sensitive dyes.
- Add a natural scent to mask the acidic smell of the vinegar.
- Add **less glycerine** for a more rigid slab (50/50 polymers and plasticizers is considered the max)
- Reduce amount of gelatine or leave it out altogether
- **Stiffeners** such as fibres, yarn or natural debris may be added for more structure and reinforcement.
- Try creating a starch-based polymer without gelatine to make this plastic vegan.

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

## Method

### 1. Preparation

- 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

- dissolve the starch in a separate bowl using a few tablespoons of hot water
- when the gelatine is completely dissolved, add the starch mixture and stir for another 5-10 mins at 80 degrees
- finish with a thick but still somewhat liquid paste

### 4. Casting

- The mix is a thick paste that needs to be cast (quickly!) by smearing across a the surface of the mold with a spatula.
- It cures quickly at this stage, so be fast
- 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.
- The slab will shrink relatively quickly, then take it off the mold and let it air dry
- Alternate drying with some periods of keeping it pressed. If you have a roster you can dry and press at the same time.



## Drying/curing/growth process

- Mold depth: N/A
- Shrinkage thickness: 5-10 %
- Shrinkage width/length: 5-10 %

### Shrinkage and deformation control

Letting it dry for a week or so to get to the final form. It will be flexible at first but will slowly get more rigid. The slab needs some attention during drying as the edges that are thinner will curl up. Trim the piece before it's completely hard. Occasionally press down the slab under a stack of books for a few hours to keep it flat.

### Curing agents and release agents

None.

### Minimum wait time before releasing from mold

Ready to be released after 1-2 hours.

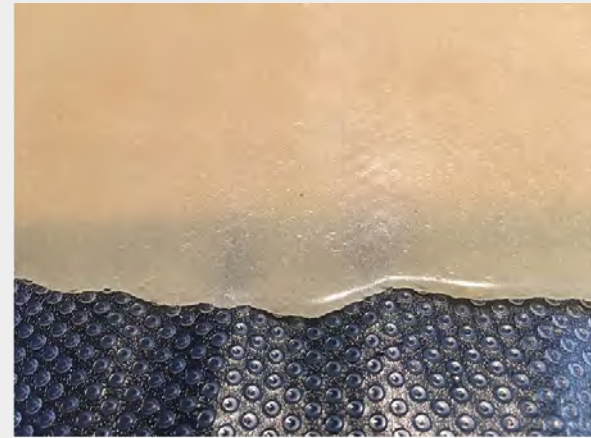
### Post-processing

Trim and cut into desired shape before the slab is completely dry and hardened.

Store in a dry and ventilated room. Keep pressed until fully dry.

### Further research needed on drying/curing/growth?

Not sure.



*The strach-based rubber curing, Loes Bogers, 2020*



*Trimming the - still flexible - slab for further curing, Loes Bogers, 2020*

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