



LIGHT & COLOR

Making bioplastic

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Introduction

Material that plays with light, such as colored glass, has fascinated me for a long time. Colored light gives a feeling of peace; a healing atmosphere. The theme of my thesis and graduation project is therefore the healing powers of light and color. To make this visual, I wanted to use colored material that allows light to pass through to create work that is reminiscent of stained glass. In my thesis I argue for a revaluation of the forgotten healing powers of light and color in health practice, and I describe which color has what effect on our physical, emotional and mental body. With my light installation I tried to express that light and color attract everyone, and that we need them for our health.

In these times of overproduction and overconsumption, I think it is important to create with sustainability and reuse in mind. Because my graduation project is about healing, it was therefore an important condition for the choice of materials. In order to achieve the characteristic aspects of glass or classic plastic, after much research I chose to make bioplastic and created my own bioplastic recipe which I share later on. The final work was created intuitively. You can find it on instagram and my website.

Bioplastic, a sustainable choice?

The transparency of the bioplastic reflects both the choice of material and the making process, which I like to keep transparent. Below I briefly describe the advantages and disadvantages of bioplastic.

Classic plastic is made from petroleum; a fossil resource that is slowly running out. Bioplastic is made from renewable resource such as corn starch. Pesticides and artificial fertilizers are used for the production of these crops. It is polluting for the soil, groundwater, nature and therefore also the health of animals and humans. A small advantage of bioplastic is that the plants absorb CO₂ and use it in photosynthesis while growing, so the production has a slightly lower CO₂ emissions. Bioplastic is a versatile material and can be made from e.g. vegetable waste. It is being experimented with in fashion- and interior design as an alternative for leather.

Bioplastic is a confusing term, as there are biobased plastics and biodegradable or compostable plastics. Biodegradable means that the material can be broken down by micro-organisms into natural gases, but this rarely happens in nature. Compostable means that the bioplastic can only be broken down in an industrial composting plant at a constant 60 degrees and high humidity.

Conclusion: bioplastic is dependent on sustainable production and correct waste processing to be a sustainable alternative.

Recipe for gelatin bioplastic

Bioplastic consists of mainly three ingredients: 1) a biopolymer: *starch*, *agar agar* (plant-based), or *gelatin* (animal-based), wich makes the mixture solid. 2) a plasticizer: *glycerin*, for (in)flexibility, and 3) a solvent: *water*, which is needed for dissolving and mixing.

Materials:

- Small saucepan
- 3 spoons
- 2 weighing containers, (and 1 for pre-mixing color powder)
- Digital kitchen scale, measuring cup
- Food coloring (preferably organic)
- Stove or electric heater
- Mold(s) for casting (e.g. a plastic lid)
- Time: approximately 20-40 min.

Gelatin	1.5	7.5	12	gr
Glycerin	0.7	3.4	5.4	gr
Water	10	50	80	ml

1. Place the mold(s) on a flat surface.
2. Weigh the water (or use a measuring cup), and pour it into the pan.
3. Weigh the gelatin and glycerin and add it to the water, stir cold.
4. Place the pan on the heater and bring to boil briefly (but not for too long because the gelatin will lose its binding power). Watch how the gelatin dissolves.
5. Let it simmer over low heat, keep stirring gently.
6. Add food coloring (if this is powder, first mix it in a bowl with a bit of cold water to prevent clumping).
7. Keep stirring, the substance needs to be between a dressing and a syrup.
8. Cool for \pm 5 min., then cast into a mold.
9. Let it dry for 4 to 7 days and then remove it from the mold.

Results

Recipe

After many tries with different biopolymers, I chose gelatin. The gelatin bioplastics resembled glass and worked best for what I had in mind.

Glycerin

Glycerin ensures that the bioplastic remains flexible and retains its shape, but the downside is that many bioplastics are quite sticky.

Water

The risk of molding bioplastic is reduced by using distilled or demineralized water. After using a number of bottles of demineralized water, I switched to tap water to avoid plastic waste. This worked and there was no mold formation. I made sure that the bioplastic mixture did not become too viscous but felt like dressing to make it easier to cast and have a higher yield.

Gelatin

I tried to reduce the amount of gelatin in the recipe. In the end, instead of 12 grams of gelatin in 60 ml of water, I was able to use 7 grams of gelatin, but the amount between 8 and 10 grams in 60 ml of water worked best.

Mold

I have reused a lot of collected plastic packaging (trays and lids) to avoid purchasing new molds (except for the ingredients) as much as possible for sustainable reasons. Pouring into these plastic packaging worked well, and there was no need to pre-grease them with glycerin. This also saved me glycerin.

Food colorings

I used natural dyes in gel, juice and powder form ('Mein Farbspass' powder from Biovegan, gels from Cake Décor).

Yellow: turmeric powder

Red: beetroot juice/powder

Blue: spirulina powder, blue dye

Orange: turmeric, beetroot juice/powder

Green: spirulina, turmeric, green dye

Purple: red beet, red cabbage powder

Purple was the most difficult color to create, which is why there is little purple in my work.

Making process

At first I preferred not to make gelatin (animal-based) bioplastic. I am not vegan or vegetarian, but I pay a lot of attention to consuming less animal products. But there is something to be said for every bioplastic recipe, animal- and plant-based. Gelatin is made from the skins and bones of cows or pigs. This is a by-product of meat production and is not thrown away. After much consideration and the results of the experiments, I chose gelatin bioplastic.

Making bioplastic is labor intensive, the process from cooking to casting takes an average of 30 minutes and then needs to dry for 4 to 7 days. The yield of the ratios with 60 ml of water was on average 1 bioplastic sheet of 12 x 15 cm. Is it worth it? Yes, because unlike ready-made material, this way you are even more involved in the making process.