www.amsterdamuas.com

www.waag.org

BIOMATERIALS TOOLKIT

TOOLKIT FOR CRITICAL CREATIVE RESEARCH
INTO NEW NATURAL DESIGN MATERIALS

Recipes and samples of the biomaterials can be found at:
www.samplemanagementtool.com

project by Loes Bogers, funded with an NWO Comenius Teaching Fellowship
label design by Maria Viftrup for TextileLab Waag
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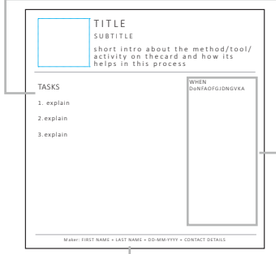
SELECT AND EXECUTE

INTRODUCTION
The short description allows you to quickly assess whether the activity or method on the cards suits your needs.

CATEGORY
Depending on what learners already know and depending on what topic you want to center your activities, the toolkit is divided in four categories. Cards can be about materials science, biofabrication, diy micro-biology, or critical making.

ESTIMATED DURATION
This is an estimate of how long it will take to execute the activity.



TASKS
The steps that need to be taken in order to execute the activity or method

RECOMMENDATIONS
The recommendations section can list ingredients, tools, tips, notes and references about the activity or method mentioned on the card.

ATTRIBUTION
The maker or source on which the card is based.

EXPLAIN - EXPLORE - EXTEND

Explain cards are knowledge cards that support your understanding of (working with) biomaterials.

Explore cards contain activities and methods for learning and critically engaging with biomaterials.

Extend cards build on the previous cards and help to deepen your pratical knowledge of biomaterials.

CRITICAL CREATIVE RESEARCH

all the cards contain prompts to get you started on working with biomaterials.

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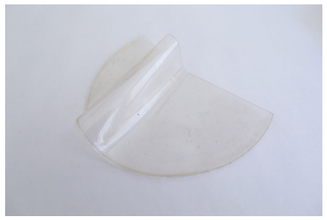
MATERIALS SCIENCE | DIY MICROBIOLOGY | CRITICAL MAKING | BIOFABRICATION

AGAR BIOPLASTIC

AGAR IS A GUM POLYSACCHARIDE FOUND IN RED ALGAE



AGAR, CARRAGEENAN, AND ALGINATE ARE GUM POLYSACCHARIDES. AS FOOD-SAFE BIOPOLYMERS THEY ARE USED WIDELY IN THE FOOD INDUSTRY AS THICKENERS AND STABILIZERS BUT THEY ALSO HAVE GOOD FILM-FORMING QUALITIES.

SEE ALSO: Alginate bioplastic, Carrageenan bioplastic

EST. TIME:

AGAR BIOPLASTIC

INGREDIENTS
5 g Agar, 15 g Glycerine, 250 g Water

TOOLS
Scale, pot, stove, spoon, wide mold or casting surface

TASKS

Making the bioplastic:
•Weigh the ingredients and bring water up to 80 degrees C
•Add glycerine and agar, stir gently to avoid bubbles
•Allow mixture to thicken
•Keep the temperature around 80C
•Stir gently throughout for 30 mins
•Allow water to evaporate until liquid is like light syrup

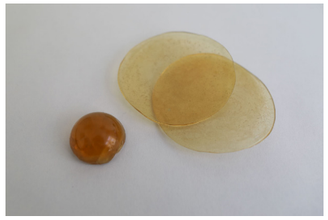
Cast the bioplastic:
•Cast the bioplastic slowly in the center of the mold
•Allow to dry for a week without touching

Release the bioplastic:
•Check that the plastic no longer feels cold to the touch
•Gently peel it off the surface.

REFERENCE: Biofabricating Materials lecture notes, by Cecilia Raspanti, Fabricademy 2019: https://class.textile-academy.org/classes/2019-20/week05A/

GELATINE BIOPLASTIC

GELATIN IS HYDROLIZED COLLAGEN: A POLYMER FOUND IN CARTILAGE, BONE AND SKIN OF ANIMALS.



GELATIN OR HYDROLIZED COLLAGEN AND IS FOUND IN CARTILAGE, BONE AND SKIN OF ANIMALS. IT IS USED AS A GELLING AGENT IN FOOD, MEDICINE AND MICROBIOLOGY, AND IS USED IN PHOTOGRAPHY AND PAPER SIZING.

SEE ALSO: Agar bioplastic, Carrageenan bioplastic

EST. TIME: 20 MIN-2HRS

GELATINE BIOPLASTIC

INGREDIENTS
50 g gelatine, 15 g glycerine, 250 g water

TOOLS
Scale, pot, cooker, spoon, casting surface

TASKS

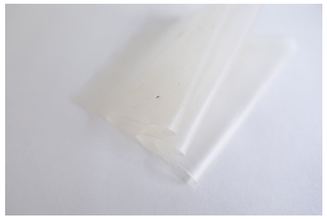
Making the bioplastic:
•Weigh the ingredients
•Bring water up to 80 degrees C
•Add glycerine and gelatine, stir gently to avoid bubbles
•Allow mixture to thicken
•Keep the temperature around 80C
•Stir gently throughout for 10-20 mins
•Allow water to evaporate until liquid is like a thick syrup

Cast the bioplastic:
•Cast the bioplastic slowly in the center of the mold
•When solidified: release from the mold
•Allow to dry fully for a week

REFERENCE: Biofabricating Materials lecture notes, by Cecilia Raspanti, Fabricademy 2019: https://class.textile-academy.org/classes/2019-20/week05A/

ALGINATE BIOPLASTIC

ALGINATE IS A GUM POLYSACCHARIDE FOUND IN BROWN ALGAE



AGAR, CARRAGEENAN, AND ALGINATE ARE GUM POLYSACCHARIDES. AS FOOD-SAFE BIOPOLYMERS THEY ARE USED WIDELY IN THE FOOD INDUSTRY AS THICKENERS AND STABILIZERS BUT THEY ALSO HAVE GOOD FILM-FORMING QUALITIES.

SEE ALSO: Agar bioplastic, Carrageenan bioplastic

EST. TIME:

ALGINATE BIOPLASTIC

INGREDIENTS
For the bioplastic:
•10 g Sodium Alginate, 20 g Glycerine, 200 g Water.
For the cross-linker:
•10 g Calcium Chloride, an additional 100g water.

TOOLS
Scale, blender, spray bottle, glass jar, casting surface

TASKS

Prepare the bioplastic mixture:
•Weigh the ingredients
•Put the glycerine and half of the water in a blender
•Turn on the blender, sprinkle in the sodium alginate
•When the paste is homogenous, add the remaining water
•Leave the mixture overnight in a closed jar

Prepare the cross-linker:
•Put the calcium chloride in a glass jar
•Add 100 g hot water and stir to dissolve
•Allow to cool and transfer to spray bottle

Cast the bioplastic:
•Cast the bioplastic slowly in the center of the mold
•Spray generously with calcium chloride solution
•Allow to dry until no longer cold to the touch

Release the bioplastic:
•Gently peel it off the surface.

REFERENCE: Biofabricating Materials lecture notes, by Cecilia Raspanti, Fabricademy 2019: https://class.textile-academy.org/classes/2019-20/week05A/

MYCELIUM-HEMP COMPOSITE

COMPOSITE OF HEMP FIBRES, CHITIN AND OTHER POLYMERS

MYCELIUM IS THE VEGETATIVE PART OF THE MUSHROOM, AND CONSISTS OF SEVERAL BIOPOLYMERS SUCH AS CHITIN, CELLULOSE AND PROTEINS.

SEE ALSO:Kick-start your Mycoculture by Fabtextiles https://issuu.com/nat_arc/docs/myceliumfabtextiles

EST. TIME: 20 MIN-2HRS

MYCELIUM-HEMP COMPOSITE

INGREDIENTS
GIY kit from grown.bio, plain flour (30g per kg grow kit)

TOOLS
Scale, 70% alcohol, scissors, large bowl, scalpel, cling film, latex or nitrile gloves, molds

TASKS

Clean all tools and surfaces with 70% alcohol
Prepare the composite mix
•Wear gloves and open the bag with clean scissors
•Add the GIY mix to the bowl and mix in the flour
•Crumble up all the lumps with your hands until even

Prepare the mold:
•Desinfect the mold with alcohol
•Distribute the mycelium-hemp mix
•Cover the mold with cling film
•Punch small holes every 3 cm with a clean scalpel

Let it grow:
•Put the mix in a dark place at 20-25 degrees C
•Allow the mycelium to colonize the substrate for 3-5 days
•When it is completely white, carefully take it out

Dry the composite:
•Dry the composite for 2-3 hours at 40 degrees C
•Keep the door of the oven open to allow moisture to escape
•Bake for another 2 hours at 80 degrees until light and firm

REFERENCE: Grow-It-Yourself kit via Grown.bio https://www.grown.bio

CARRAGEENAN BIOPLASTIC

CARRAGEENAN IS A GUM POLYSACCHARIDE FOUND IN RED SEAWEED

AGAR, CARRAGEENAN, AND ALGINATE ARE GUM POLYSACCHARIDES. AS FOOD-SAFE BIOPOLYMERS THEY ARE USED WIDELY IN THE FOOD INDUSTRY AS THICKENERS AND STABILIZERS BUT THEY ALSO HAVE GOOD FILM-FORMING QUALITIES.

SEE ALSO: Agar bioplastic, Alginate bioplastic

EST. TIME:

CARRAGEENAN BIOPLASTIC

INGREDIENTS
16 g carrageenan kappa, 3 g glycerine, 350 g water

TOOLS
Scale, pot, cooker, spoon, casting surface

TASKS

Making the bioplastic:
•Weigh the ingredients
•Bring water up to 80 degrees C
•Add glycerine and carrageenan, stir gently to avoid bubbles
•Allow mixture to thicken
•Keep the temperature around 80C
•Stir gently throughout for 30 mins
•Allow water to evaporate until liquid is like light syrup

Cast the bioplastic:
•Cast the bioplastic slowly in the center of the mold
•Allow to dry for a week without touching

Release the bioplastic:
•Check that the plastic no longer feels cold to the touch
•Gently peel it off the surface.

REFERENCE: Lugae Valenti, Making Carrageenan 2021: https://vimeo.com/386012184

LEVELS OF CLEAN AND DIRTY

'DIRT IS MATTER OUT OF PLACE' - MARY DOUGLAS (1966)

THE IDEA OF 'WASTE' IS NOT TIED TO THE FUNCTIONALITY OR MATERIALITY OF AN OBJECT. REGARDING THE SOCIAL, CULTURAL, POLITICAL AND ECONOMIC DYNAMICS ALLOWS FOR A MORE HOLISTIC PERSPECTIVE ON WASTE, BIOREMEDIATION, AND SUSTAINABILITY.

SEE ALSO: Safety levels of clean and dirty, Define your eco-compatibility principles.

EST. TIME: 20 MIN-2HRS

LEVELS OF CLEAN AND DIRTY

INGREDIENTS

TOOLS
paper, pens, disussion space

COLLECTIVE ACTIVITY

Reappropriating waste materials for bioremediation asks us to reconsider our own and others' ideas about dirt and cleanliness, and about waste and newness.

Collaboratively discuss and untangle what kind of ideas, beliefs, and value systems are in place regarding the materials you (want to) work with.

With your group, work out strategies to incorporate these beliefs and values in a positive way.

REFERENCE: Sources: Mary Douglas, Purity and Danger, 1966