Making Waste Desirable

BIO-COMPOSITE

BIO-PLASTIC

BIO-LEATHER

This project will be investigating and exploring ways in which interior spaces could utilise biomaterials. It will be understanding the issues of conventional interior textiles and processes and how they can be improved. The design intent for the project is to experiment with biomaterials and biodegradable matter to offer theoretical alternatives to non-renewable materials. Conventional materials within commercial interiors are mostly plastic-based, non-renewable and do not decompose back into nature. This is creating more and more unnecessary waste and unsustainable design outcomes. Investigations will be led with bio-matter as a regenerative source to experiment with waste to create completely sustainable materials. The aim is to understand the possibilities biomaterials can have in retail interior spaces and to make waste a desirable resource.

The three materials focused on were bio-plastic (Thermosetting), bio-leather and a ceramic composite. These mimicked the most common materials within a retail environment and the hardest to dispose of environmentally. The theoretical uses that came from the biomaterialswere a bio-composite for interior wall/floor tiles, a bio-plastic to replace plastic laminates and a bio-leather which could replace conventional leathers and faux leathers in upholstereditems.

MATERIAL MAKING

Hypothesis Intension

The testing intended to use waste within the local community and create natural materials. The materials are then tested to understand their characteristics and how well they work. A variety of materials have been constructed to test the possible applications it could have and what it could replace in the retail interior environment.

WASTE/BY-PRODUCT → MATERIAL INGREDIENTS → MATERIAL CREATION

STEP BY STEP...

1. INGREDIENT STERILISATION
2. REMOVE THE INGREDIENT MOISTURE
3. GRIND THE INGREDIENTS INTO A POWDER OR DESIRED TEXTURE
4. MAKING THE MATERIAL MIX
5. SCOOP MIX INTO A MOULD
6. LEAVE TO AIR DRY

SOURCING

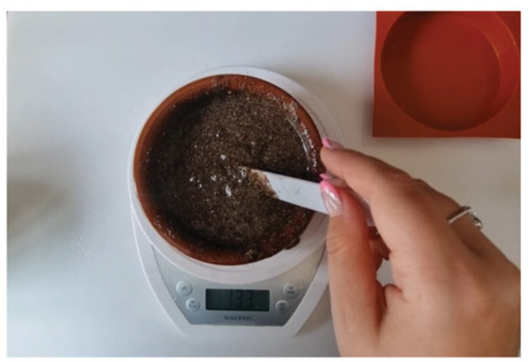
Natural materials have been sourced to create a completely biodegradable material that can naturally decompose back into nature. Locally sourced by-products are a great way to incorporate food waste within businesses that can create these materials. Some examples are eggshells, coffee grounds, tea leaves, and vegetable and fruit peels. All can be dried out and crushed into a fine powder as a base or colour additive to the material.

MAKING

To make the material a sterilised environment is the most important element as whilst drying it can be a breeding ground for mould and ruin the material physically. Whilst making your material it is important to have a binder as this is what will hold the material together and bond into a solid form. In my testing sodium alginate and agar have been used as a binder. To change colour variations natural pigments are available for example spices, flowers and other by-products can visually change the material aesthetically.

DRYING

Depending on the sample size and water content will depend on how long a material will take to dry. After my investigations, a material can take from 1-2 weeks to completely dry. However, the material needs a warm environment and if it takes too long to dry will eventually mould.



MATERIAL CREATION

SCAN ME

To view the making process of the coffee composite material scan the QR code above.

THE MATERIAL EXPERIMENTS

ITERATION ONE
Possible Conventional Material Comparison: Plastic-like Material (Thermosetting)
Characteristics: Rigid, Toughness, Wear Resistance, High Density
Issues: Non-Waterproof. Thin, Dried Curled
Results: A solid grainy composite

ITERATION TWO
Possible Conventional Material Comparison: Plastic-like Material (Thermosetting)
Characteristics: Rigid, Brittle, Wear Resistance, Resilient
Issues: Non-Waterproof. Thin, Dried Curled
Results: A stiff plastic textured material

ITERATION FOUR
Possible Conventional Material Comparison: Leather-like Material
Characteristics: Flexible, Malleable, Stretchy, Smooth, Shiny, Resilient
Issues: Non-Water Proof, Can be torn with force
Results: A smooth leather-like could replace conventional leathers

ITERATION SIX
Possible Conventional Material Comparison: Plastic-like Material (Thermoplastic)
Characteristics: Very Flexible, Some Stretch, Resilient, Wear Resistance
Issues: Non-Waterproof. Thin, Can be torn with a high amount of pressure

FIRST ITERATIONS

The first step in understanding these biomaterials was to first explore what could be created and how. To gather a general knowledge base of how each material reacts and test variations and ingredients.

Material Testing

ITERATION SEVEN
Possible Conventional Material Comparison: Paper-like
Characteristics: Brittle, Crumbly
Issues: Fragile and can easily be broken
Results: Not a suitable material

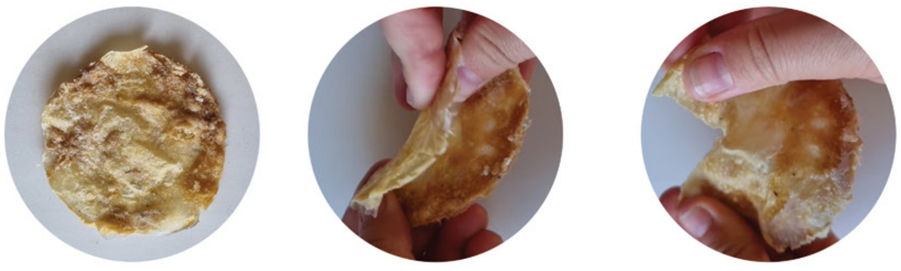
Material Testing

Material Testing

ITERATION EIGHT
Possible Conventional Material Comparison: Paper-like
Characteristics: Can be Torn, Thin, Small Stretch, Can be written on
Issues: Non-Water Resistant, Easily Torn, Not Resilient
Results: Possibly replace a plastic material?

Material Testing

Material Testing



ITERATION ELEVEN
Possible Conventional Material Comparison: Paper-like
Characteristics: Can be Torn, Thin, Small Stretch, Can be written on
Issues: Non-Water Resistant, Easily Torn, Not Resilient
Results: A paper-like material a powdery texture similar to a wallpaper texture?

Material Testing

Material Testing

ITERATION TWELVE
Possible Conventional Material Comparison: Composite (Ceramic/Brick-like)
Characteristics: Rigid, Wear Resistance, Resilient, Hard
Issues: Can be broken, Grainy
Results: A hard composite material, possibly replace ceramics or composite surfaces.

MATERIAL CHARACTERISTICS

Water Resistance

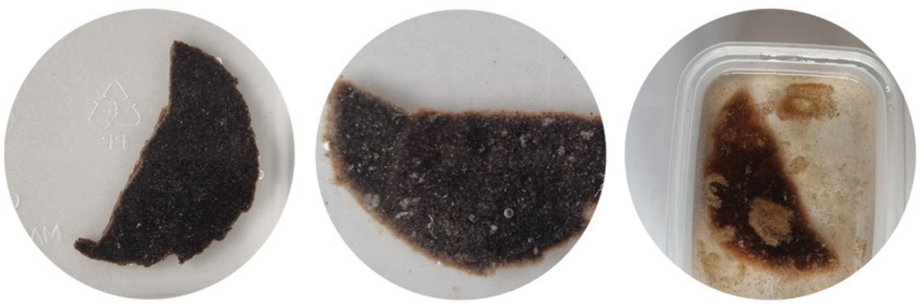
Coffee and Eggshell Composite: Water Resistance Testing
The composite took around three hours to start to disintegrate

SCAN ME

Material Testing

Agar Bioplastic: Water Resistance Testing
The agar plastic took around three hours to start to expand and deform

Material Testing



Agar Bio-Leather: Water Resistance Testing
The agar leather took around one to two hours to start to disolve in the water, it quickly became a gel like material and disolved in the water completely

Material Testing

MATERIAL LIKE CERAMIC COMPOSITE

Abrasion Resistance	●●●●●●●●●○
Water Resistance	●●●●●●●○○○
Flexibility	○○○○○○○○○○
Lightweight	●●●●●○○○○○
Brittle	○○○○○○○○○○
Fragile	○○○○○○○○○○
Rough Texture	●●●●●●●●○○
Tensile Strength	●●●●●●●●●○

High Abrasion Resistance / Medium Water Resistance / Very Rigid / Fine Material Layers

This material has characteristics of a ceramic material, slight chalk feel, rigid and high abrasion resistance. Not as fragile as ceramic as it can be dropped without fracture. It can be sanded down for a smoother feel or left with a rough texture. It could possibly mimic a tile material base and could be finished with a glaze.

MATERIAL LIKE THERMOSETTING PLASTIC

Abrasion Resistance	●●●●●●●●●○
Water Resistance	●●●●●●●○○○
Flexibility	●●○○○○○○○○
Lightweight	●●●●●●●●●○
Brittle	●○○○○○○○○○
Fragile	●○○○○○○○○○
Rough Texture	●●●●●●●●○○
Tensile Strength	●●●●●●●●●○

Malleable / High Water Resistance / Flexibility / High Wear

This material has the properties of a thermosetting plastic, which means once it is has dried it cannot be heated and reformed. However during the water resistance test it withstood 3 hours submerged without movement. After this it became a flexible material and expanded, if this was to be dried again it could be formed differently. It still has some flexibility and is hard to destroy by hand.

MATERIAL LIKE LEATHER

Abrasion Resistance	●●●●●●●●●○
Water Resistance	●●●●●●●○○○
Flexibility	●●●●●●●○○○
Lightweight	●●●●●●●●○○
Brittle	○○○○○○○○○○
Fragile	○○○○○○○○○○
Rough Texture	●●●●●●●●○○
Tensile Strength	●●●●●●●●●○

High Flexibility / Leather feel / Malleable / Low Water Resistance / High Rub Resistance / Low Abrasion Resistance

This leather-like material has a physical texture of leather with a ‘shiny’ side and a matte side. It is very flexible like a leather and a high rub resistance. However the water resistance test showed it disintegrates really quickly and easily and within the hour turned into a sludge mixture.

MATERIAL COLOUR VARIATIONS

To create a range of colour combinations for the materials, natural dyes are the safest and most effective within these materials as when they biodegrade the dye will not negatively impact the soils. The opportunity to be able to include natural dyes within these materials makes them more desirables to consumers with more variety and choice within their material selection. These natural dyes are again sourced from the waste produce around the local area. Flowers can be sourced from nearby florists when the flowers die. Waste like seeds, coffee and vegetable peels can be used to enhance the colouring of materials whilst also utilising the waste available.

BIO-LEATHER

TEA LEAF

COFFEE GROUNDS

TURMERIC

SUNFLOWER SEED

ROSE PETAL

BIO-COMPOSITE

PUMPKIN SEED

SUNFLOWER SEED

COFFEE GROUND

DRIED FLOWER

TEA LEAF

BIO-PLASTIC

TURMERIC

SUNFLOWER SEED

COFFEE GROUNDS

DRIED LEAVES

ROSE PETAL