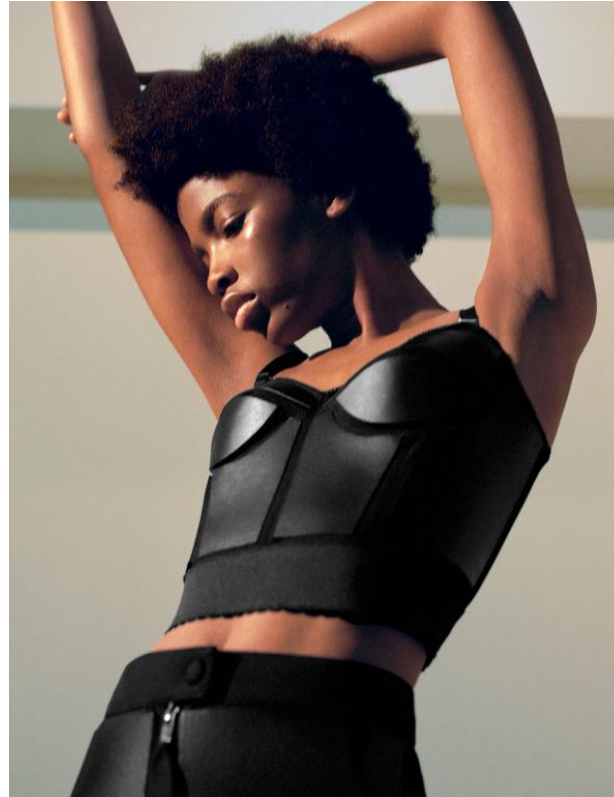


Biodegradable Material

BIODEGRADABLE MATERIAL

What is Mycelium Leather?

Mycelium leather (often called "myco-leather" or "fungal leather") is a sustainable, bio-based alternative to traditional animal leather. Instead of using animal hides, it is grown using the root structure of fungi.



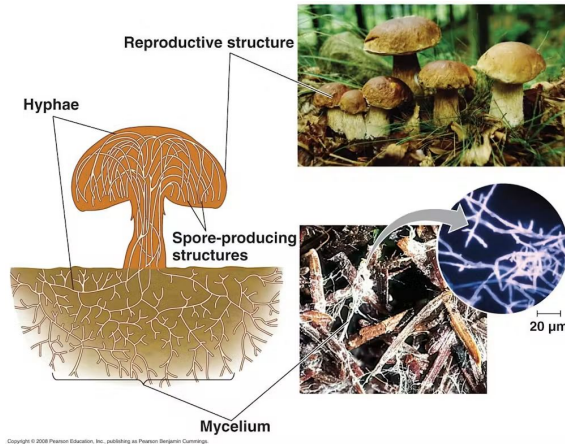
1. Biology Knowledge

Introduction to Mycelium

Biological basis, Cell level, environmental factors

Cellular Foundation

Mycelium is the vegetative part of fungi, composed of a network of hyphae. It belongs to one of the six kingdoms, Fungi, which are heterotrophs that play a critical role as decomposers.



Microscopic Structure

The microscopic structure of the mycelium hyphae network (EDB, 2015, p.46).

Basic info of fungi & cells in Society (EDB, 2015, p.17).

2. Biology Knowledge

Fabrication Process of Mycelium-Based Leather (scientific process)

Senior Secondary Biology

How it Works: The Biological Process

Mycelium is the vegetative part of a fungus—a vast, underground network of microscopic, thread-like filaments called hyphae.

- 01 Human Needs and Environment:** Mycelium spores are introduced to an organic substrate, typically agricultural waste like sawdust, hemp, or corn stalks.
- 02 Network Formation:** As the fungi "eat" the organic material, they grow rapidly, weaving their hyphae into a dense, interlocking mat.
- 03 Maturation:** Once this mat reaches the desired thickness and density, it is harvested.
- 04 Processing:** The material is heat-treated or dried to stop the biological growth, and then finished, dyed, and tanned using environmentally friendly, bio-based agents to give it the texture, strength, and durability of leather.

"Growth is regulated by environmental factors: moisture, temperature, and nutrient availability in the substrate. The effects of temperature, pH or inhibitors on the activities of enzymes."
(EDB, 2015, p. 22).



3. Biology Knowledge

Sustainability Values of Bio Materials

Senior Secondary Biology

- 01 Growth (Inoculation):** Sensitivity and responsibility in balancing human requirements with the needs of a sustainable environment.
- 02 Technological Influence:** Advancements in technology influence society and the natural environment.
- 03 Sustainable Development:** Science and technology can be applied to foster sustainable practices and address environmental challenges.
- 04 Ethical Responsibility:** Consider the societal and environmental implications of scientific and technological decisions.
- 05 Ecology system:** Oxygen and carbon balance (carbon footprint) Reduce the use of animal skin, such as, leather and fur.



Science-Technology-Society-Environment (STSE) Connections (EDB, 2015, p58).

4. Biology Knowledge

Sustainability Values of Bio Materials

Senior Secondary Biology

Biodegradable materials allow for the natural cycling of organic matter back into the ecosystem, reducing the long-term accumulation of waste.

Microorganisms play a key role in the decomposition process, transforming complex organic materials into simpler substances that can be recycled by nature.

01 Materials Cycling

Essential elements move through an ecosystem, highlighting the interdependence of organisms. It examines the roles of various organisms, such as producers, consumers, and decomposers, in the continuous recycling of materials.

02 Carbon Footprint

The carbon footprint measures the total greenhouse gas emissions, such as carbon dioxide, resulting from the production, transport, and disposal of fashion items. Traditional fashion materials often have a large footprint due to energy-intensive manufacturing processes.



Functioning of an ecosystem (EDB, 2015, p35).

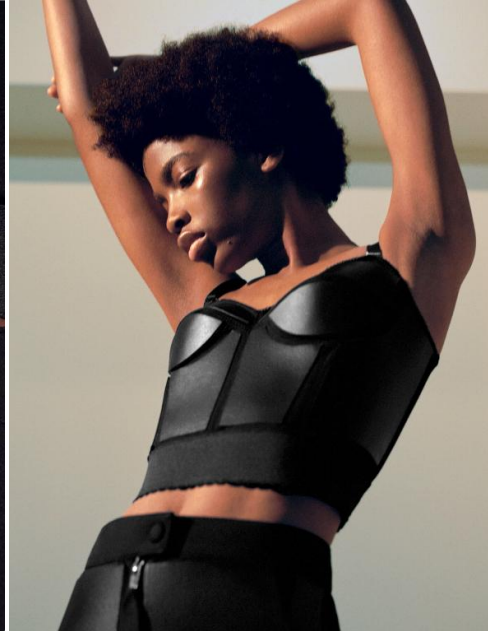
5. Sustainable tradition

Bio in Fashion Industry

Mylo mushroom mycelium material, vegan biodegradable with luxurious feel, perfect for eco-conscious Qipao and traditional silhouettes.

Ancient Chinese sustainability principles meet modern material science in fashion innovation.

There are also mycelium material made from pineapple and corn.



Stella McCartney FW 2022

Bio in Fashion Industry

Sustainable Luxury

Bottega Veneta is exploring innovative sustainable luxury by experimenting with a mushroom-based materials, Ephea Uma, to create future fashion pieces (Webb, 2026).

The Weave

Other brands that previously experimented with mycelium struggled with its delicate nature. Bottega used their 50-year-old Intrecciato weaving technique, which distributes tension across the entire piece and solves the material's structural weakness.



Bottega Veneta Intrecciato Weave

Example in fashion industry



Mata Durikovic 2023 FW Bioplastic, bioluxury



Applying the biodegradable leather in Fashion

Harnessing Material Properties

Natural Rigidity

Mycelium is naturally rigid, offering structural stability that can be leveraged to create self-supporting designs.

Inherent Firmness

This inherent firmness allows designers to experiment with forms that maintain their volume and shape without needing excessive internal support.



MM Alternative Leather

The Breakthrough Solution

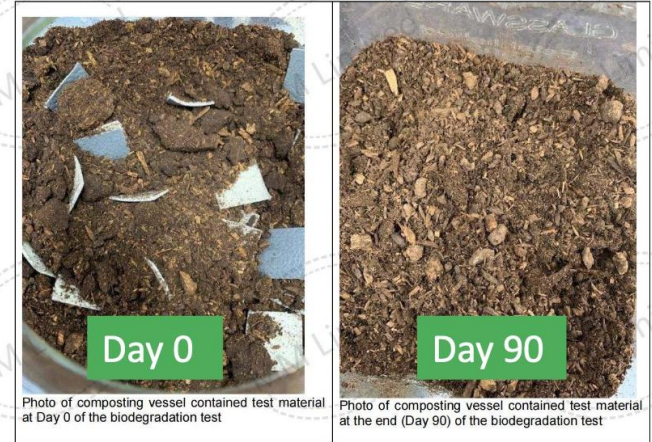
- **100% Plant-Based:** Crafted exclusively from FSC-certified paper and BCI-certified cotton.
- **World-First Certification:** ISO 14855-1 certified, achieving >90% biodegradation in just 90 days.
- **Leather Alternative:** Authentic leather look & feel without undergoing polluting tanning processes (MM Limited, 2024).

Circular Economy

Closed-Loop System: Partners with the hospitality industry to upcycle end-of-life bedsheets into raw materials for new MM leather goods.



Photo Appendix



*** End of Report ***

MYCL biodegradable material

MYCL (Mycotech Lab), founded in Indonesia in 2015, is a pioneering bio-material startup. The core mission centers on utilizing **mushroom mycelium** as a natural adhesive to develop high-performance materials.

- **Mylea Leather**

A high-performance leather alternative cultivated directly from **mycelium fibers**. Mylea offers a swifter growth cycle, demands fewer resources, and emits substantially less carbon. It was featured in a leading Japanese fashion brand, Double, Spring/Summer '22 and Fall/Winter '23 collections during Paris Fashion Week (MYCL, 2026).



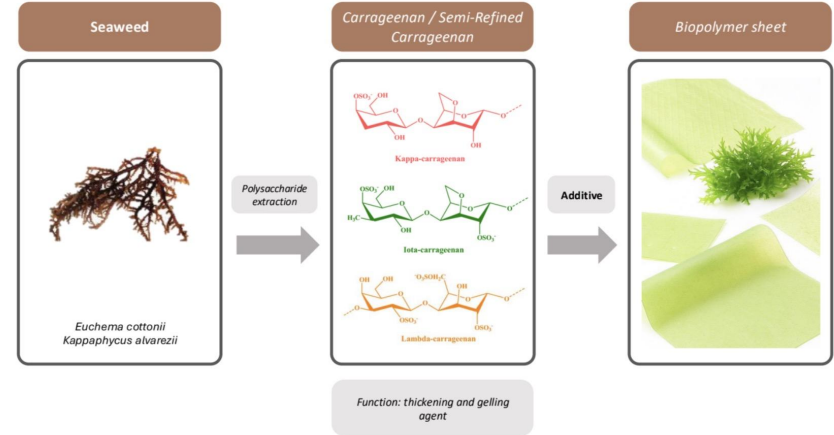
MYCL Seaweed Biopolymer

- **Mylea Sea**

Mylea Sea is the latest bio-material innovation from MYCL, designed as a semi-translucent. Crafted from carrageenan extracted from Macro Red Algae. It is 100% bio-based, offering a smooth, ethereal aesthetic, providing a high-performance and sustainable alternative to synthetic films (MYCL, 2026).

- Indonesia's #1 seaweed producer
- Lower CO2 emissions
- Biodegradable – in-home composting
- Lower water consumption

Seaweed Biopolymer Production Method



Applying the biodegradable leather in Fashion

Merging Innovation with Fashion

Avant-Garde Structure

Integrating circular flounce patternmaking into mycelium-based pieces allows for avant-garde shapes that push the boundaries of traditional garment construction.

Biological Dictates Aesthetic

This approach demonstrates how the biological "nature" of a material—specifically its rigidity—can directly dictate and enhance the final aesthetic silhouette in luxury fashion.



Applying the biodegradable leather in Fashion

Sustainability Meets Functionality

Natural Growth & Structure

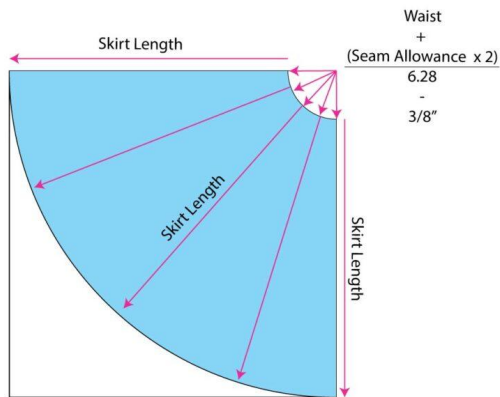
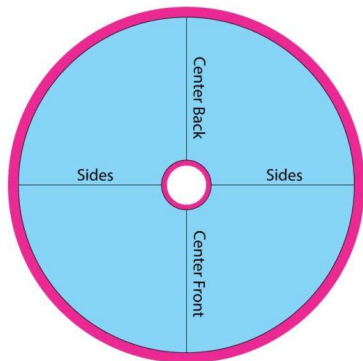
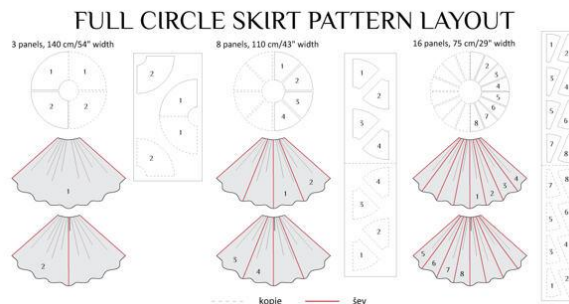
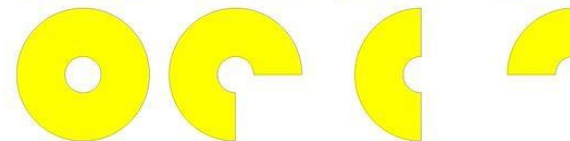
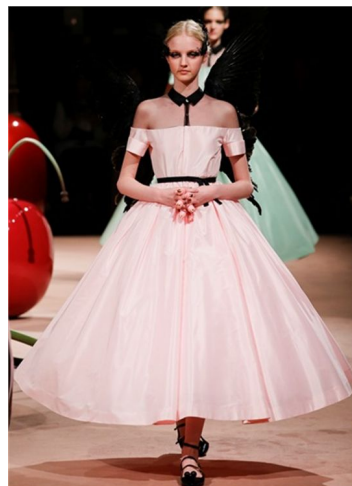
Using the material's natural growth and structure reduces the need for synthetic stiffeners/ interfacing/ bones, further aligning the design with sustainable fashion goals.

Functional Aesthetics

This synthesis of material science and design showcases a practical application of scientific inquiry by utilizing biological characteristics for functional aesthetic purposes.



Method of making Circular Flounce



Method of making Circular Flounce



