


Using Fungi to Transform Waste into Sustainable Insulation

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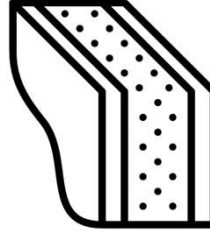
Background: a carbon and waste crisis

40%
energy reduction in well-insulated homes¹



Conventional insulation:

- Energy-intensive
- Non-recyclable
- Depletes finite resources

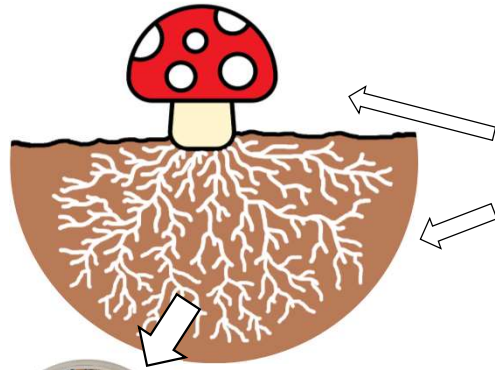


1.5 billion beverage cartons per year are not recycled in the UK²



Solution: fungal mycelium!

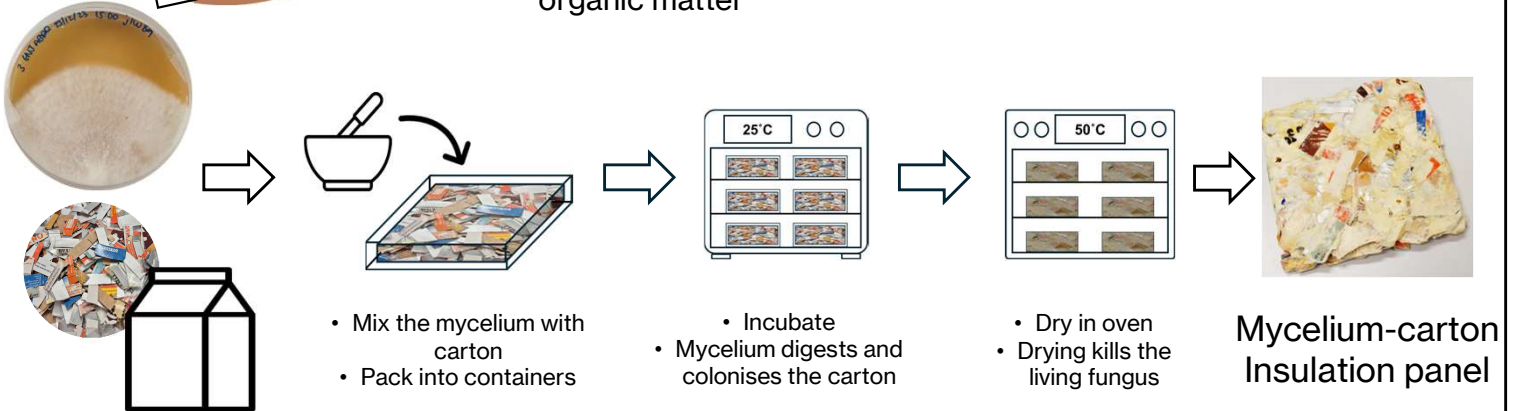
What is mycelium?



- **Fungi** are key decomposers
- **Mushrooms** are the temporary fruiting bodies of fungi
- **Mycelium** is the main body of fungi
- Mycelium grows as a **network of filaments** and breaks down organic matter

How to grow mycelium on cartons?

- Screen different species
- Increase carton content to encourage growth on pure carton
- Optimise conditions



Results: effective and sustainable

Feasibility: Successfully produced materials



- Insulation panels successfully made
- Good integrity
- Consistent

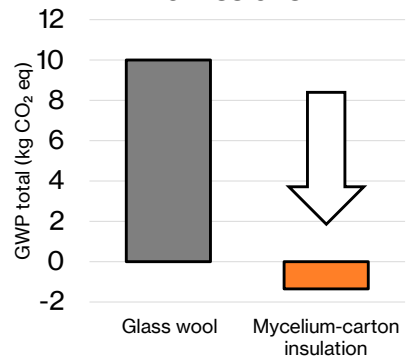
Thermal properties: Good at insulating



As good as polystyrene insulation!

Mycelium-carton insulation:
 $\lambda = 0.035 \pm 0.001 \text{ W/m}\cdot\text{K}$

Sustainability: Negative carbon emissions



Conclusions:

Fungal-derived biomaterials as ideal insulation materials:
low carbon ✓ uses waste ✓ keeps heat in ✓

References:
[1] The Building Centre (2007) *Cavity wall insulation in existing dwellings: A guide for specifiers and advisors.*
[2] Zero Waste Europe (2020) *Recycling of multilayer composite packaging: The beverage carton A report on the recycling rates of beverage cartons in Germany, Spain, Sweden and the UK*