

# Sustainable Innovation in 3D Printing: Bio-Based Materials from Fungi

## Engineered Living Materials for AM

Fungal mycelium is emerging as a promising base material for sustainable, bio-based composites. These biodegradable materials made from renewable resources are versatile, suitable for packaging, acoustic panels, and construction elements. Within the EU-funded project LoopOfFun, Fraunhofer IGB researches „Engineered Living Materials“ (ELMs) based on living fungal cells.

### Award-winning research on mycelium inks

In his bachelor's thesis, in close collaboration with Fraunhofer IGB, Niklas Hug focused on reproducible mechanical evaluation of 3D-printed mycelium materials. The bioink consists of living fungal cells, agricultural by-products, and natural binders that ensure the paste flows smoothly during printing and maintains its shape. As the fungus grows, its mycelial network strengthens and binds the structure. Hug fabricated mechanical test specimens using additive manufacturing and compared them with molded samples. His results – based on tensile, compression, and nanoindentation tests – form a protocol for future qualification and optimization of sustainable, mycelium-based feedstocks. Recognized for Sustainability and Innovation, Niklas Hug was honored with

the Sustainability Award of the degree program Material Design – Bionics and Photonics for bridging biology, materials science, and digital fabrication.

### Towards biointelligent additive manufacturing

Fraunhofer IGB sees great potential in mycelium-based ELMs – particularly for sustainable lightweight structures, biodegradable components, and biologically active filters. While similar results can be achieved by growing mycelium in molds, 3D printing enables freeform, precise design and faster prototyping. Combining sustainability, biological functionality, and digital manufacturing, these living materials open new pathways for future biointelligent systems.

### Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB

Dr. Achim Weber  
Tel. +49 711 970-4022  
[achim.weber@igb.fraunhofer.de](mailto:achim.weber@igb.fraunhofer.de)  
[www.igb.fraunhofer.de](http://www.igb.fraunhofer.de)

[exhibit overview](#)