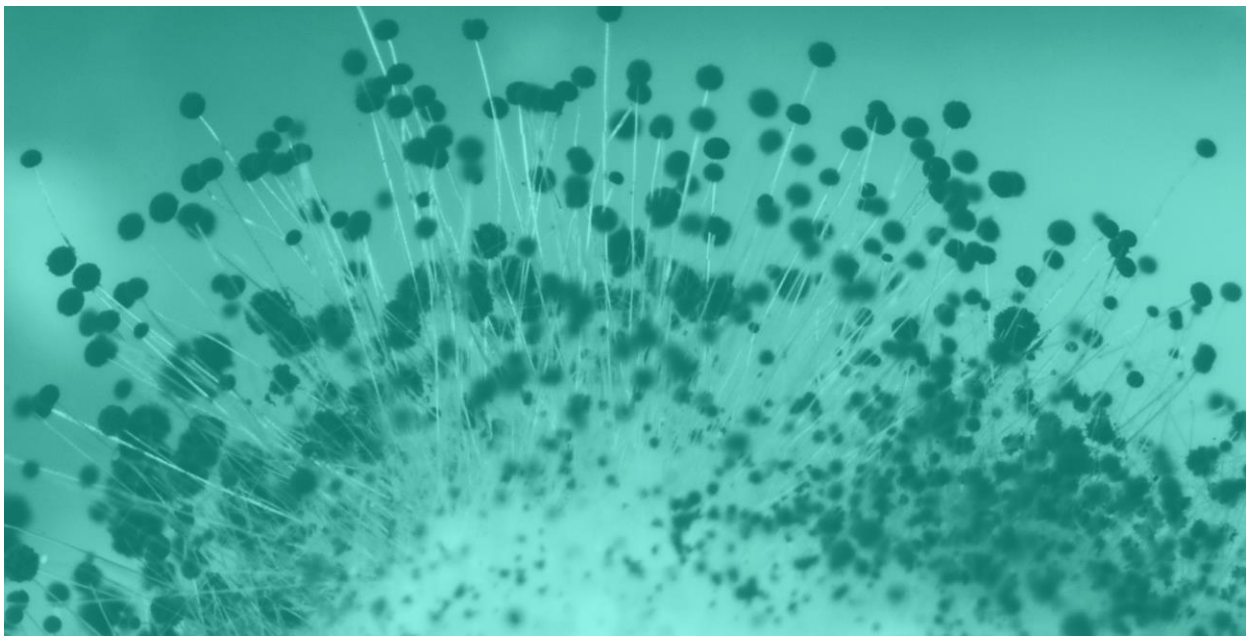

FUNGAL FIBERS

"Fungi for the Future"

FUNGAL FIBERS - The goal of this project is to develop a completely new process chain for the production of bio-based, vegan textiles from chitosan fibres with regard to filament and staple fibre yarns. – After one year of research we can already observe some promising results!

The industrial cultivation of fungi is already state-of-the-art in the production in various fields, including pharmaceuticals like penicillin or proteins as food supplements, whereas the polymeric fungal components (chitin and chitosan) are largely unused and normally sent for composting or thermal recycling. However, the controlled environment in which fungi are grown during industrial cultivation allows for the production of polymers with high purity, high molecular weight, and adjustable properties to meet specific potential application such as fibres for textile production. Moreover, the combined fungal-based production of the above products offers a cost advantage over other biopolymers and a real chance of economic competitiveness over petroleum-based polymers. Due to limited resources such as petroleum, water and arable land, as well as increasing environmental degradation and conflict potentials, there is a great social and entrepreneurial interest in providing competitive, socially and ecologically sustainable raw material alternatives for the textile industry such as fungi.

Fungal-based Chitosan – The new fiber raw material

The present project intends to produce chitosan from the well-established and globally dominant industrial cell factory Aspergillus niger with very high throughput, high quality and purity, short production time, gentle extraction and multiple refining and transformation options. Here, the chitosan is obtained from primary raw material sources (industrial cultivation of genetically engineered filamentous fungal) as well as secondary raw material sources (waste stream from industrial filamentous fungal cultivation).

Chitosan is a polysaccharide and chemically closely related to chitin, the most abundant compound in living nature after cellulose. It occurs naturally in a variety of sources: Insects, crab and crayfish shells, and as a structure-determining cell wall component of all fungi. Therefore, chitin can be derived from by-products in the production of crab meat, insect protein, or fungal biomass waste from industrial processes. Chitosan, for its part, can be readily produced from chitin by deacetylation. Due to the remarkable properties of chitosan such as biodegradability, antibioticity and compatibility with cotton and cellulose it can be considered as a promising biomaterial for the production of natural fibres for general textile applications but also suitable for medical applications like hospital apparel and wound bandages as well as sportswear like shoes and apparel, where the chitosan can inhibit bacterial growth, improve hygiene and prevent odor.

Our project

In the project, chitosan produced from fungi will be spun into fibres by a solution spinning process, texturized and coated. Subsequently, woven or knitted fabrics will be produced, coated as well and used for prototyping. After one year of research, we can already observe some promising results: The spinning process of first fungal-based Chitosan as ´benchmark-fibre´ for the whole project passed successfully, while we are now implementing first dying trails and establishing requirement profiles for fungal-based future sport and medical textiles.

Our objectives

Until February 2025 we strive to development a whole new process chain for the production of bio-based textiles from this above-mentioned innovative chitosan source, both as primary raw material (industrial mushroom cultivation) and as secondary raw material (waste stream from industrial mushroom cultivation), as well as to establish a competitive chitosan production in Europe.

We are looking forward to providing more valuable project insights in the near future!

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