

## **FunColor**

### Production of fungus-based melanin dyes as a biological substitute for chemically synthesized grey-brown-black textile dyes

FunColor is the name of a new research project led by the Technical University of Berlin as part of the BIOTEXFUTURE Innovation Space funded by the Federal Ministry of Education and Research. The BIOTEXFUTURE is an extensive, multi-year funding concept aiming to support the transformation process of the textile industry and of the entire textile value chain from petroleum-based to bio-based and accompanied by an overall social science research. The Innovation space is co-led by adidas AG and ITA of RWTH Aachen University.

In this context, FunColor contributes to the research into bio-based textile dyes. The "Fun" in the title of the project does not stand for fun, but for "Fungi", so it is about fungi-based dyes.

#### **Our motivation**

Colors brighten our lives. Food, textiles and everyday objects are colorful. However, most of the colors commonly used are produced on a petrochemical basis, many of which, such as azo dyes, are toxic. Both the production, the dyeing process and the use of petrochemical colors often lead to human health risk and are environmentally hazardous. In addition, with industrial wastewater streams, synthetic dyes and pigments in textile manufacturing processes are often disposed of in the environment, entailing massive ecosystem damage. We therefore striving to explore fungi as a natural source for various colors and produce new ones from renewable plant-based raw materials using fungal fermentation. This biological origin and biotechnological production are supposed to pave the way to produce ecologically sustainable colors and pigments in the future.

#### **This is what we intend to achieve**

The aim of FunColor is to develop a biotechnological process for the production of biological color pigments by using the established fungus-based "cell factory" *Aspergillus niger*. This fungus is to be used to produce pyomelanin, a black pigment. The objective is to demonstrate the applicability of bio-based pigments for a more sustainable and environmentally friendly coloring of textiles and thus reduce the release of environmentally harmful petrochemical dyes.

## **How we proceed**

We will genetically modify *Aspergillus niger* to increase the pyomelanin production and develop standard procedures for fermentation, extraction and formulation protocols. Another goal is to establish a stable, high-throughput and cost-efficient textile dyeing process that offers colour fastness, colour strength and wash fastness at the same time. In a further step, we will develop, produce and characterize textile demonstrators using different yarn resources.

## **The current state of the art**

Initial analyses of the still young research project show that wool and polyamide can be dyed into a beautiful, deep brown color. In the case of the cellulose fibre 'lyocell', initial results indicate success with a light grey. Already quite positive outcomes for the scientists involved in this project.

The innovative, bio-based coloring process also promises success in another area that is becoming increasingly important: UV protection. Research teams are currently working on the assumption that the fungus produces a molecule that effectively protects it from UV radiation. Initial results show that this molecule also functions as a UV protection mechanism in textile dyes. The FunColor team is therefore working to ensure that clothing can protect against UV radiation. There is also the possibility that the molecule could have an antimicrobial effect on clothing and other textiles. However, this additional positive property still needs to be confirmed by more in-depth research.

In the course of 2025, the first demonstrators will be presented as illustrative objects after it has been possible to obtain numerous fungal strains, producing significantly more pigments than the original strain.

The FunColor researchers see the current challenge in increasing the amount of melanin: „We strive to produce several hundred grams, which is currently a challenge on a laboratory scale. We are pursuing several approaches to achieve it. This is exciting for all of us!“ says project leader Dr Timothy Charles Cairns from TU Berlin.

## **Project partner**

TU Berlin (project management)  
ITA RWTH Aachen University  
TVU, Textilveredelungsunion GmbH  
adidas AG

## **Project management**

Prof. Vera Meyer  
Dr. Timothy Charles Cairns (deputy)

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## **About BIOTEXFUTURE**

BIOTEXFUTURE is an innovation space for research on bio-based textiles funded by the Federal Ministry of Education and Research (BMBF). It is implemented in cooperation between RWTH Aachen University (ITA, Institute of Textile Technology and STO, Chair of Sociology of Technology and Organization) and adidas AG. The industry and research partners are working together on the conversion of textile value chain from petroleum-based to bio-based.

Website: [www.biotextfuture.info](http://www.biotextfuture.info)

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