Project Overview: SmartBioFinish

Development of a textile finishing technology based on anchor peptides for water and oil-repellent properties.

As consumers, we appreciate the excellent water- and dirt-repellent finishes on outdoor jackets, upholstered furniture, or car seats. The biggest challenge is that these textile finishes are still predominantly based on the use of per- or polyfluorinated chemicals (PFAS), which are set to be phased out EU-wide due to their harmful effects on the environment and health. Industry has been desperately searching for environmentally compatible solutions for years. With the SmartBioFinish project, a team of scientists from the Institute of Textile Technology (ITA) at RWTH Aachen University and the Leibniz Institute for Interactive Materials (DWI), Aachen, together with industry partners, is now on the verge of presenting a biobased, highly effective solution.

The SmartBioFinish research team is working on developing a textile finishing technology for water-, oil-, and chemical-repellent properties based on anchor peptides, i.e., proteins or short chains of amino acids that can adhere to surfaces. The project team uses an innovative technology that enables highly specific bonds between textile materials and functionalization. The technology is already known from plant research, where anchor peptides are being investigated as an environmentally friendly alternative to pesticides to protect fruit and grain from harmful insect infestation.

The SmartBioFinish project not only focuses on biobased solutions for use in sports textiles but also addresses the particularly demanding field of personal protective equipment (PPE). This includes, for example, firefighter suits, which must not only be water- and oil-repellent but also fire- and chemical-resistant. Project partners include the DWI as well as the companies IBENA, SCHÜLER & CO. K.G., and adidas AG. By integrating industrial companies from the very beginning of the scientific research project, it is ensured that the results are accompanied and evaluated with regard to marketability. The following provides a closer look at the project.

Our Motivation

In the BIOTEXFUTURE innovation space, new biobased textiles are being developed to shift the textile value chain from petroleum-based to biobased. For the production of 100% biobased functional textiles, it is necessary to develop not only biobased fibers but also biobased finishes. Particularly in the field of water-, oil-, and chemical-repellent properties, switching to biobased materials is crucial in order to replace the currently used finishes based on per- and polyfluoroalkyl substances (PFAS). This is of great importance in light of the recent EU regulation, which provides for a ban on around ten thousand PFAS due to their toxicity and harmful effects on health and the environment. For several years now, there has been an urgent search for equally high-performance and economically competitive alternatives.

Our Goal

The aim of the SmartBioFinish project is to replace PFAS in textile applications by developing 100% biobased water-, oil-, and chemical-repellent finishes based on anchor peptides. The functionality of these water- and oil-repellent finishes will be validated and demonstrated in two different applications: sports textiles and personal protective equipment (PPE).

Our Approach

The project is being carried out in four main development steps:

- Development of water-, oil-, and chemical-repellent active agents based on anchor peptides
- Development and optimization of finishing formulations
- Development of the finishing process technology
- Demonstration of the functional properties in relevant industrial applications

At the DWI – Leibniz Institute for Interactive Materials, the development of anchor peptide-based water-, oil-, and chemical-repellent finishes takes place. Anchor peptides and bioplastics are tested for their water- and oil-repellent properties. Based on these active agents, the finishing formulations and process technologies are developed. The optimized formulations and an industrially applicable process technology are being developed at the ITA of RWTH Aachen. SCHÜLER & CO. K.G. will test the finishing technologies developed by ITA for end applications on selected textile materials. Subsequently, the project partners adidas AG and IBENA will develop demonstrators to evaluate the technical and economic performance of the new technologies.

Current Status

When searching for suitable anchor peptides – peptides are organic amino acid compounds – two aspects are particularly important: reliable adhesion to the textile and high repellency against water, oils, fats, and chemicals. After a screening of possible peptides by DWI, the task is to determine which anchor peptide can be used on which textile. This is done with the help of a fluorescence microscope. Promising anchor peptides were identified in a short time, and application tests on firefighter clothing were carried out. Firefighting PPE must be flame-resistant and thus meet particularly demanding requirements. It is therefore especially encouraging that the adhesion of the peptides is already long-lasting and withstood abrasion testing successfully.

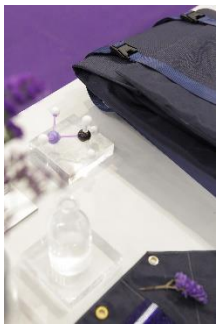
Currently, wash resistance, water vapor permeability, and hydro- and oleophobic properties are being tested with larger fabric samples. The researchers are focusing primarily on biobased textile finishes for use in sports and firefighting clothing, as well as for workwear in industry.

By the end of 2024, suitable anchor peptides had been identified, enabling the project to move forward with investigations into the finishing process. By the end of 2025, the first demonstrators are expected to be available as reference examples, and successful practical implementation is to be demonstrated. With the completion of the research project, it will then be up to industry to further develop, adapt, and integrate SmartBioFinish into existing production processes for their specific needs. If the basic research of SmartBioFinish continues to develop as promisingly as it has in the first months of the project, the development of highly functional, biobased PFAS alternatives indeed seems possible in the foreseeable future.

SmartBioFinish at ISPO 2025






Contact

Nicole Espey, M.A.
BIOTEXFUTURE: Projektmanagement Office
ITA-Veranstaltungs- und Stakeholdermanagement

ITA – Institut für Textiltechnik der RWTH Aachen University
Otto-Blumenthal-Str. 1
52074 Aachen
Tel.: +49 241 80-23418
Mobil: +49 176 268 180 64
Fax: +49 241 80-22422
Nicole.Espey@ita.rwth-aachen.de