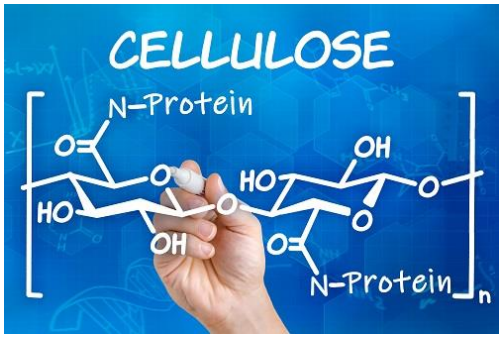
TransMIT
Gesellschaft für Technologietransfer mbH

Production of protein-grafted cellulosic fibers by a simple two-step process

Cellulose-modification, grafting with proteins, hydrophobins, cellulosic functional materials, hydrophobic materials and textiles

DESCRIPTION OF TECHNOLOGY

Cellulose is the most abundant organic polymer on Earth usable for many purposes ranging from paper sheets to textiles. There is great demand for chemically modifying cellulose in order to create additionally tailored functional materials from cellulose, e.g. for creating drug delivery systems for the pharmaceutical industry. But up to date it is difficult and strenuous to specifically modify cellulose fibers (e.g. by usage of highly reactive NCO-terminated oligomeric compounds).



The new method presented herein consists of two simple steps for chemically modifying the surface of cellulosic materials, e.g. macroscopic sheets, microscopic fibers, filaments or nanoparticular cellulose.
Step one is a chemical or enzymatic oxidation, transforming the C6 carbon atoms of the cellulose to a carboxylic group (-COOH) without degradation of the backbone-structure of cellulose. The second step is the covalent coupling of a protein, e.g. a hydrophobin, by formation of amide bonds between the primary amine side-groups of the protein and the newly created carboxylic groups on the surface of the cellulosic material. The attached proteins provide the modified cellulosic surfaces with new characteristics, in case of hydrophobins a resistant and repellent surface which is very durable because of the chemical bonding of the protein to the cellulosic surface.

AT A GLANCE …

Application Fields

- biomedical applications - drug delivery systems
- Industrial textiles
- Clothing textiles

Business

- Pharmaceutical Industry
- Textile industry

USP

- Simple grafting process
- Manifold adjustable process
- Low energy demand

Development Status

- Process is proven on laboratory-scale by use of hydrophobin

Patent Status

PCT-application pending, filed on November 11th, 2019

REFERENCE NO. **TM 1084**

APPLICATION FIELDS

The fields of application are very numerous, depending on the specific chemical modification. Currently the most intensively tested modification is increasing the hydrophobicity by grafting with hydrophobins. A major field of application for hydrophobised cellulose is the textile-industry, not only regarding clothings but also the broad field of industrial textiles. Many other possible fields of application are, for example, drug delivery systems, fabrics with anti-microbial surfaces etc.

ADVANTAGES OVER THE PRIOR ART

Compared to the established chemical and physical processes for modifying cellulosic materials, proteins are environmentally friendly tools for the functionalization of cellulose. The oxidation-process (step one) can be performed by use of enzymes, providing a very low energy demand in combination with high chemical specificity.

STATE OF THE PRODUCT DEVELOPMENT

The complete two-step process for protein-based functionalisation of cellulosic materials is already proven on laboratory scale by use of hydrophobins as sample proteins. The chemical modifications are assured by spectroscopic measurements (FT-IR-analysis) and material testing (measurement of contact angle with and without hydrophobin-modification).

COOPERATION OPPORTUNITIES

On behalf of the Universität für Bodenkultur Wien (University of Natural Resources and Life Sciences, Vienna) the TransMIT GmbH is looking for cooperation partners for further development or licensees in Germany, Europe, US, and Asia.

A TECHNOLOGY OF

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