Sustainable, Recyclable Textile Floor Coverings made from Hemp and small Admixtures of Biopolymers for Glueing the Layers.

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Abstract

The project '*HempTuft - Sustainable, recyclable textile floor coverings made from natural plant fibres*' aims to develop a tufted textile floor covering according to the principles of 'Design for Recycling' from bast fibres and bio-based as well as biodegradable polymers. This innovative product has a lower environmental impact than products based on i.e. biobased polyamide and enables high-quality fibre-to-fibre recycling by using the Lyocell process. The selection of regionally available materials will ensure the security of raw material supply with a resilient supply chain as well as avoid the unintentional release of harmful microplastics through mechanical abrasion.
Concerning the carpet secondary backing, the development of a nonwoven based on hemp has been chosen in order to keep the ecological impact as low as possible. The nonwoven can be produced directly from mechanical separated fibres with a low number of process steps (typically carding, cross-lapping, needling). If a woven fabric is used instead, several more process steps are necessary, combined with higher energy input, material loss and finally higher process costs. To improve the bond between the pile yarn respectively the secondary backing and the adhesive component (e.g. PLA), small shares of PLA fibres can be mixed into the pile yarn and the secondary backing, or a PLA film can be needled on to the secondary backing. In addition, the performance characteristics, as well as the environmental and economic properties and the cost-effectiveness of the entire carpet structure, are evaluated.

This research project is driven by three partners:

- The TFI - Institut für Bodensysteme an der RWTH Aachen e.V. (TFI, Aachen, DE) leads the work packages (i) for tufting and production of floor covering and (ii) coordinates the project work of all research partners.

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- The Faserinstitut Bremen e.V. (FIBRE, Bremen, DE) is mainly engaged in the work packages for (i) selection and quality assessment of natural fibre input and (ii) development of a hemp-based nonwoven as secondary backing.
- The Technical University of Liberec (TUL, Liberec, CZ) leads the work packages for development of biodegradable glueing layers.

Ongoing work is to optimize yarn parameters, the construction of the carpet as well as the construction of the carpet and setting up a reliable glueing concept for connecting the layers to achieve long product lifetime. The final results are expected at the end of the project in mid of 2027.

Keywords: hemp floor covering, tufting, design for recycling