

Project:

Blends of Natural and Biosynthetic fibres for eco-efficient yarns and Carpets - BleNaBis

Participants:

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2. Institut für Bodensysteme an der RWTH Aachen e. V. (TFI); D
3. INOTEX spol. s r.o.; CZ
4. Agritec Plant Research s.r.o.; CZ

Funding:

AiF Cornet 01.08.2016 – 31.07.2018

Abstract:

Background:

Currently, there is an increasing request for sustainable products on the side of the consumer. This trend as well as the guidelines of the governments in the national and international area towards sustainable productions has the effect that producers look for sustainable products. Currently, this request cannot be operated due to high requirements and the price pressure in the field of home textiles. In the field of carpets, currently only woolen carpets exist as products from natural raw material. However, they have a very bad life cycle assessment due to the CO₂ emission of the sheep. But, the life cycle assessment is an important selection criteria for architects and thereby for the customers. Whereas, line seed fibers is a by-product of the linseed cultivation, which shows a good energy balance with 2,75 MJ/kg in contrast to e.g. polyamide with 165 MJ/kg. Moreover, the straw interferes in agriculture because the fibers do not rot very well. Furthermore, the material would be suitable in terms of price, however, its properties are not sufficient for the application in carpets. The necessary properties like mechanical resistance can be found in bio-polyamides (BioPA). However, these materials are too expensive in terms of price as that they could be used in home textiles.

Goal:

For this purpose, the goal of the project (Fig. 1) is the combination of BioPA and linseed fibres into yarns for home textiles. The whole process chain, from the fibre production or the cultivation up until the completed prototype of a home textile, will be depicted with a focus on the yarn production. The biological and mechanical preparation of the natural fibres up until the fibre tape, the production of staple fibres from BioPA, the rotor spinning of the fibre blends from natural fibres and BioPA, the weaving and tufting into textile surfaces as well as the dyeing of the yarns and surface are thereby investigated and developed.

In conclusion, there should be dyed and undyed demonstrators of fibres, yarns and textiles in order to be able to convince future customers of the materials. Moreover, a guideline shall be created as assistance for the processing of BioPA and linseed fibres. Thereby, the industry is able to perform a transmission on other products in the home textile sector at a later point.

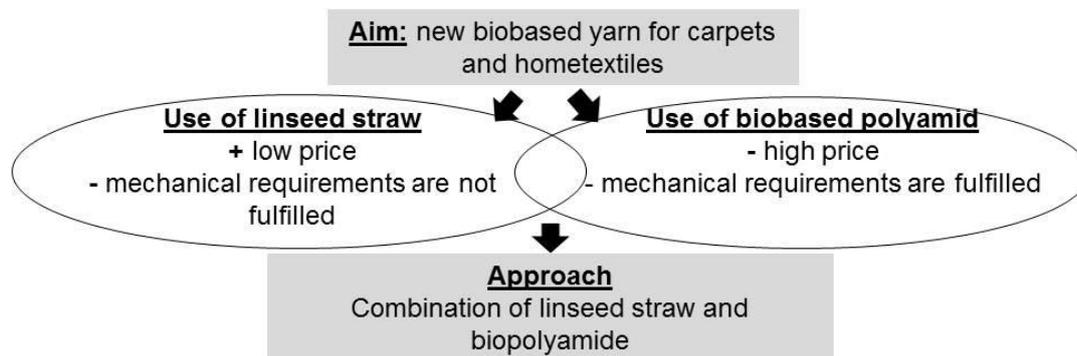


Figure 1: Deduction of the method of resolution from the deficit

Economic Impact:

The project has an economical influence on different branches, for example the producers of carpets and home textiles, who can serve the estimated request of 14 Mio m² with a sales value of up to 40 €/m² sustainable carpet. In conclusion, also the multiplicity of retail shops profit from it (approx. 19,000 shops in Germany), who can offer a new product, which they can define from the competition of the construction markets. Another branch consists of 327 farms in Germany, which can profitably emit a disturbing by-product. Further branches are the chemical fibre industry, which can thereby open up new application fields for BioPA and also editors of natural fibres and processors of fibres to yarn and textiles profit from it because they have new innovative material with which they can expand their portfolio.

Results

The flax fibres were removed from the oilseed straw and cleaned. At the same time, staple fibers were produced from a bio-based polyamide by melt spinning. The two staple fibers were then mixed and processed into a rotor-spun yarn. This yarn was used for the production of tufted textile floor coverings. Finally, the textile floor covering was characterised in accordance with the relevant standards and regulations and a life cycle analysis was carried out to assess the sustainability of the new carpet yarn. The new yarn meets the requirements for textile floor coverings in the home and public sector with regard to emissions, fire behaviour, antistatic properties and dyeability. However, the requirements regarding abrasion resistance are not met. Therefore the yarn in the tested variant as loop pile is not suitable for the home and public area. Since the mixture of oilseed fibres and bio-based polyamide fibres is superior to conventional carpet yarns from an ecological point of view, it makes sense to use the yarn in less mechanically stressed products. Bath mats, for example, are a promising field of application as the mechanical properties achieved are sufficient for this product.

Project Consortium:

The project consortium consists of Inotex on the Czech side and ITA and TFI on the German side. Inotex has both experiences in the preparation of plant materials to natural fibres as well as in their dyeing. The ITA has long-term experience in the production of filaments from standard- and biopolymers and the production of yarns both from chemical fibres as well as natural fibres. The TFI is specialised on the area of textile floor coverings and can perform next to the production in the lab- and pilot scale also the testing and ecological evaluation of textiles. Furthermore German and Czech SMEs are part of the consortium. The companies are covering the entire process chain

Acknowledgement:

The IGF project 170 EN of the Forschungsvereinigung Forschungskuratorium Textil e.V., Reinhardtstraße 14-16, 10117 Berlin was supported by the AiF within the framework of the programme for the promotion of industrial joint research IGF of the Federal Ministry of Economics and Energy on the basis of a resolution of the German Bundestag. The authors would also like to thank project partners INOTEX, CZ and TFI, GER.

Supported by:



on the basis of a decision
by the German Bundestag

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