Durable and weatherproof: optimising natural fibre composites for vehicle exterior parts

About this project

LowCarboVan

Durable and weatherproof: optimising natural fibre composites for vehicle exterior parts

Markets:

Material: Biocomposites, Natural fibres

This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Energy.

Technology Transfer Program Leichtbau

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Context

The automotive industry is under increasing pressure to reduce CO# emissions and use more sustainable materials. Lightweight construction is particularly in demand in the commercial vehicle sector in order to reduce weight and fuel consumption. Fibre-reinforced plastics offer great potential here, as they are lightweight, resilient and can be shaped in a variety of ways. However, many of these materials have so far been based on glass or carbon fibres, the production of which is energy-intensive and relies on fossil resources. Natural fibre-reinforced plastics (NFRP) are considered a resource-saving alternative. They are made from renewable raw materials, can usually be processed using less energy and offer favourable acoustic properties. However, their use has so far been limited to components in vehicle interiors, as NFRP is susceptible to moisture and ages more quickly under long-term stress. In order to overcome these weaknesses and utilise the potential of NFRP in exterior applications, new technological approaches and a deeper understanding of the material properties are required. This is where the LowCarboVan project team comes in.

Purpose

The scientists have set themselves the goal of further developing natural fibre-reinforced plastics so that they are also suitable for use in the exterior of vehicles. The project team is concentrating on textile reinforcement structures made from flax fibres. The aim is to develop components that are not only lightweight and sustainable, but also mechanically stable, weather-resistant and durable. To achieve this, the researchers want to reduce the moisture sensitivity of the fibres, improve the bond between the fibres and the plastic matrix and analyse the material behaviour under real loads. They are also analysing how the optimised natural fibre composites can be processed economically and efficiently. In this way, they hope to pave the way for a wider use of biogenic fibre composites in lightweight automotive construction.

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Procedure

The researchers are investigating how natural fibre-reinforced plastics can be functionalised for outdoor use along the entire process chain. Flax fibres serve as the basis for various semi-finished textile products - such as woven fabrics or non-woven structures. They are specifically modified to reduce water absorption and improve adhesion between the fibre and the matrix. To this end, the team is testing chemical and physical pre-treatments as well as innovative processes such as cavity polymerisation, in which protective polymers are specifically introduced into the spaces between the fibres. The researchers are also investigating foaming resin systems to further reduce weight and simplify processing. The team then tests the finished test specimens and demonstrator components in the laboratory and in road tests - for example for their moisture resistance, mechanical strength and fatigue strength. In this way, the researchers gain a comprehensive understanding of the interactions between fibre structure, matrix and environmental influences - and can derive specific recommendations for design and processing.



Funding duration:

Funding sign:	03LB2029	**Funding amount:**	EUR 954 thousand

Final report

Further websites foerderportal.bund.de/foekat/jsp/SucheAction.do?actionMode=view&fkz=03LB2029A - LowCarboVan in the federal funding catalogue

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Project coordination

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English (EN){{ Projektpartner }}

HALARIT Composites GmbH

Lightweighting classification

	Realisation
Offer	
Products	
Services & consulting Testing and trials, Technology transfer	✓

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Lightweighting classification

	Realisation
Field of technology	
Design & layout Lightweight design, Lightweight material construction	✓
Functional integration	
Measuring and testing technology Component and part analysis, Materials analysis, Destructive analysis, Non-destructive analysis	✓
Modelling and simulation Loads & stress, Structural mechanics, Materials	✓
Plant construction & automation	
Recycling technologies Recycling	✓
Manufacturing process	
Additive manufacturing	
Coating (surface engineering)	
Fibre composite technology Others (RTM (Resin Transfer Moulding); foam pressing)	✓
Forming	
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology Fibre manufacturing	✓

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Lightweighting classification

	Realisation
Material	
Biogenic materials Biocomposites	✓
Cellular materials (foam materials)	
Composites	
Fibres Natural fibres	✓
Functional materials	
Metals	
Plastics	
Structural ceramics	
(Technical) textiles	