

Wood K plus

WOOD: next generation materials and processes – from fundamentals to implementations

Programme: COMET – Competence Centers for Excellent Technologies

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WOOD-POLYMER-COMPOSITES: PORTFOLIO WITH COMPLETELY NEW PROPERTIES

IN COOPERATION WITH THE BOREALIS POLYOLEFINE GMBH, A PORTFOLIO OF MATERIAL FORMULATIONS FOR PLASTICS PROCESSING WAS DEVELOPED. THEY CONTAIN RENEWABLE RAW MATERIALS SUCH AS WOOD PARTICLES AS FILLERS AND MEET THE HIGH REQUIREMENTS OF OUTSTANDING NOTCHED IMPACT STRENGTH, VERY LOW MATERIAL DENSITY, GOOD PROCESSABILITY AND HIGH MATERIAL STIFFNESS.

In the scope of the COMET programme and in cooperation with the Borealis Polyolefine GmbH, Wood K plus developed innovative material formulations with wood particle content, which are exceeding in their surface aspects due to use of renewable raw materials and in particular in their outstanding mechanical property profile, these properties set them apart from the current state of the art. This is enabled by the combination of special and suitable polypropylenes, an elastomer component and the selection of suitable wood particles in a composition optimised by

a Design of Experiment (DoE). As a result, an enormously improved notched impact strength (increase of 60%) was achieved without significantly reducing the flexural strength or stiffness. Both, softwood and hardwood particles, as well as fibrous cellulose powder and particles derived from plant fibers (hemp, flax and bamboo) have been used in the project. The use of such renewable raw materials replaces fillers such as talcum or glass fibers and also creates design effects, see figure. In addition, the use of these fillers can reduce the primary energy use in the manufacturing of such materials.

SUCCESS STORY



Surface design effect through wood particles in the black-colored plastic matrix (above) and natural-colored in the transparent plastic matrix (below).

Polypropylene components can be replaced by post-consumer recycled PP, whereby the primary energy use during production of the compound constituents is further reduced.

The developed material components are mixed via compounding using a twin-screw extruder. The production of prototypes for quality determination was carried out using typical injection moulding processing. In the last project year, in addition, these steps were successfully carried out on a larger scale directly at Borealis Polyolefine GmbH (upscaling process).

Impact and effects

The improved property profile and the low material density address applications of the lightweight materials in the areas of mobility and automotive interior. The industrial partner was able to address potential and interested customers with the help of the developed sample materials. The joint research project was successfully completed at the end of 2022 and the goal of improving the mechanical property profile was clearly achieved. The project partner is planning three patent applications. With this long-term project, Wood K plus has established its knowledge on material optimisation and processing in the field of thermoplastic wood composites.

Project coordination (Story)

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Project partner

- Borealis Polyolefine GmbH, Austria

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