



BestBioPLA – Fully Bio-based PLA Composites with Long-term Durability

CLIENT II – International Partnerships for Sustainable Innovation

The automotive industry, an important branch of industry in Germany and Brazil, is being pushed to limit its impact on climate change. Eco-efficient fibre reinforced plastics (FRP) with an improved CO₂ and energy balance offer an alternative in lightweight construction. The aim of the BestBioPLA project is to develop new polymeric matrix systems for the production of natural fibre reinforced plastics using locally grown resources from Europe and South America. PLA and regional fatty acids such as linseed and soybean oil as well as sisal and flax fibers will be used. In addition to the positive ecological impact, added value is increased in both countries.

CO₂ savings through lightweight construction in the automotive industry

For the automotive industry, one of the most important industries in both Germany and Brazil, climate change poses the challenge of achieving fuel savings and the reduction of CO₂ emissions through sustainable lightweight construction. However, conventional FRPs are typically based on fossil resources and are not sustainable materials due to their lack of recycling concepts and their energy and CO₂ balance during production. Due to their specific properties, plant fibres such as flax, combined with conventional thermoplastics, have established themselves in series production for automotive interiors. In contrast, bio-based polymers, such as cornstarch-based polylactide (PLA), have not been successful since material costs and properties do not meet the requirements of the automotive industry compared to conventional polymer systems. There is therefore an urgent need for research on eco-efficient materials in Brazil and Germany to determine which are suitable for mass production and sustainable in terms of recycling and the CO₂ and energy balance.

Eco-efficient materials

The goal of the BestBioPLA project is to develop alternative polymers for the production of sustainable natural fibre reinforced plastics for use in the automotive sector. On the one hand, these lightweight materials should be characterised by their durability throughout the life cycle and, on the other, they should enable recycling through biodegradability. PLA and vegetable oils should form the basis for the sustainable polymers as a matrix system for natural fibre based FRP. With the aim of improving eco-efficiency and identifying new

value chains, the BestBioPLA project will use renewable raw materials from the target regions of Brazil and Germany.



Example of an interior automobile component.

New polymeric matrix systems for natural fibre reinforced plastics

Research in the field of polymer chemistry (IFAM), natural fibres (Fraunhofer IFAM, Sisalgomes), manufacturing processes (Fraunhofer IFAM, Invent GmbH) and material characterisation (Fraunhofer IFAM, UFPB, UFCG) will be done to access fully bio-based composites that are both durable and biodegradable. Polymer development is based on PLA and regional vegetable oils. The chemical approach aims to generate partially cross-linked polymer systems that will produce the desired material properties. Flax from Europe and sisal from Brazil will be used as reinforcing fibres which have high specific strengths and stiffnesses. The raw materials, intermediate products and finished composite materials used will be characterised in terms of material science and correlated with biodegradability

(UFCG, UFPB, Fraunhofer IFAM). The sustainability and economic viability of the developments will be ensured by appropriate life-cycle assessment and a technical-economic evaluation. The most promising material compositions will be used for designing and creating a demonstrator component from the automobile interior.



Raw materials used: lactide, vegetable oil and natural fibers as well as one intermediate stage of polymer synthesis in the reaction flask.

If the BestBioPLA project succeeds, new polymer matrix systems for natural fibre reinforced plastics will be available which can be used to develop marketable products together with the industrial partners after the project is complete.

Strengthening local added value and acceptance

The approach of the BestBioPLA project of adding value to locally grown resources contributes to the sustainable development of the respective target region. Brazilian and German companies along the entire process chain, from agricultural cultivation of raw materials to industrial use, can apply the project results to build product lines and create value from them. In addition to economic aspects, it is expected that the innovative FRP will reduce the environmental impact both during production and disposal at the end of the product life, which may result in greater acceptance of this class of material in the market and society.

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BestBioPLA – Balancing between Resistance and Biodegradability – Fully Bio-based PLA Composites with Long-term Durability

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Contact

Dr. Katharina Haag
Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM
Wiener Straße 12
28359 Bremen, Germany
Phone: +49 421 2246-7643
E-mail: katharina.haag@ifam.fraunhofer.de

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