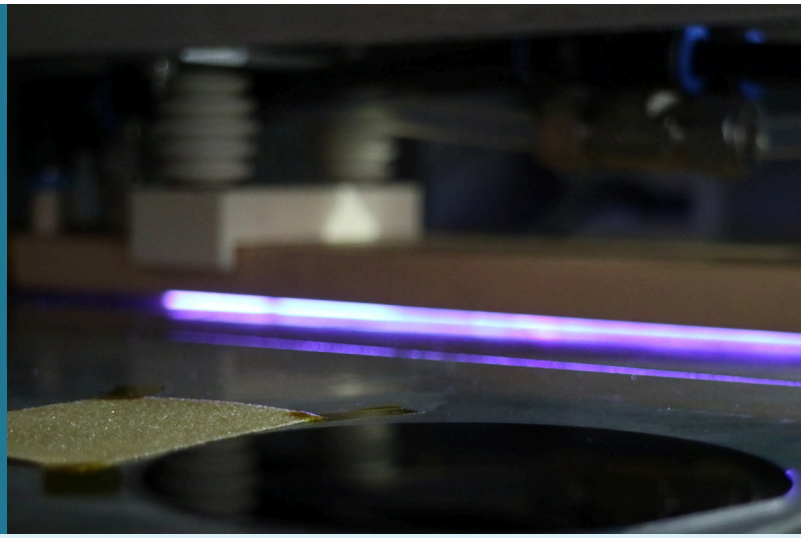
PROJECT FACTSHEET

PlasmaComp

Development of bio-based high-performance composite coatings using atmospheric pressure plasma deposition method.



Inspiration

There is an increasing demand of high-performance coatings for paper and natural fibre-based applications in key sectors like packaging, consumer, and sport goods. When it comes to coatings, the major challenge is to address the sophisticated functionalities related to its application, which often implies multilayer coatings (high material use, high weight products).

Traditionally, coating processes imply a wet chemistry that mainly uses synthetic formulations including drying/curing processes, presenting disadvantages like intense absorption into the porous natural materials, swelling effects, high amounts of coating materials and low recyclability. Additionally, there is an increasing demand for cost-saving, rapid, flexible and less-energy coating processes. In this context, there is an urge need for recyclable coatings based on renewable and sustainable sources to substitute fossil-based feedstock.

All these aspects require the development of an innovative composite coating approach that exceed the conventionally coating formulations and application technologies.

Innovation

To tackle these challenges, PlasmaComp aims to combine bio-based coating formulations and cellulosic substrates to a dry and environment-friendly plasma deposition approach involving a reduced amount of chemicals by-products generation and energy consumption.

This implies the development of bio-based composite formulations using renewable feedstock such as vegetable oils, and sustainable reinforcements such as nanocellulose/chitin fibres or graphite particles. Those will enable enhancing specific properties for packaging usage and sport goods, like water/oxygen barrier, release function for paper, hydrophobic and adhesive properties for natural fibres in composite parts, as well as antimicrobial, antistatic properties, and their combinations.

Regarding polymerization and deposition of the highly filled composite coating using atmospheric plasma, the composite coating formulation will be reactively and rheologically adapted, and the interaction between matrix and reinforcement improved. Furthermore, plasma processing concepts will be further developed to achieve a homogeneous coating on the temperature-sensitive and porous paper, as well as on natural fibres.

To demonstrate the potential of the plasma-polymerized functional bio-based composite coating for industrial application, trials and characterisation of flexible and release liner papers, as well as hemp fibre-reinforced composites samples will be carried out.

Impact

PlasmaComp will foster the development of novel knowledge, multidisciplinary research and innovation in the field of plasma-polymerized bio-based composite coatings and establish new strategic collaborations, encouraging partners' competitiveness.

By combining advanced materials' design and high-efficient manufacturing concepts, the project will lead to the production of more competitive products for the packaging and sport goods industry with the high potential for use in other industrial sectors.

Through its innovative approach of bio-based composite formulations, PlasmaComp will fulfil the requirements of a high-performance composite material. It will result in a positive impact on both environmental and health aspects, using a significant lower amount of chemicals compared to wet coatings, but also a distinctly usage of raw material and reduced energy consumption thanks to the atmospheric plasma technology.

Finally, PlasmaComp will provide a composite coating with a higher level of functionality otherwise only fulfilled by a multilayer composition and its composite design will enable lighter products to transport and lift – an important factor for packaging as well as for the lightweight construction of sports goods.

Partners

Kästle GmbH (AT) , Kompetenzzentrum Holz GmbH - Wood K plus (AT) , Mondi Release Liner Austria GmbH (AT)

Financial Support

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