COMPOCYCLE -High performance natural fiber-based composites with recyclable resins

Publieke samenvatting / Public summary

Aanleiding

Currently, most of the thermoset polymer waste is being managed by landfilling, grinding and combustion. Ground thermosets are mixed, typically in the form of fillers, in lower quality applications. Combustion mainly targets to regain the more valuable reinforcing fibre to recover energy by burning off the thermoset matrix (resin), which is the lowest class of (partial) recycling. However, in order to increase the composites' contribution to the circular economy, it is critical that not only the fibres, but the resin itself is regained and reused. Therefore the pressure on new recourses applied to produce the resins, as well as the GHG emissions from the recycling process, will be significantly reduced.

Doelstelling

The goal of COMPOCYCLE is to develop 100% biobased materials for two-component (resin+fibres) composites to replace the current fossil-based composites within the next 10 years. COMPOCYCLE will contribute to increasing sustainability and circularity of thermoset composites by making them biobased and recyclable by feedstock and (molecular) design (Subthema #1), respectively. High performance plant fibres (e.g. hemp, flax, bamboo) will replace the conventional glass fibres, offering high strength and stiffness, low cost, low density, low CO2 emissions and recyclability. COMPOCYCLE will use biobased feedstock, such as humins1, a large residual flow of low quality (Subthema #3) resulting

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Algemene informatie / General information

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from 2,5-furandicarboxylic acid (FDCA) production and convert it to new high value building blocks and subsequently novel high-performance materials (Subthema #2).

Korte omschrijving

The project will be executed in two research lines in parallel, distinguished by the TRL and scale. First research line (gram-scale) will deal with the synthesis of the building blocks and resins thereof, accompanied by their characterization. The second research line (kilogram-scale) will deal with composites samples and product prototypes preparation, followed by testing their properties and performance, as well as recycling trials and re-testing the recycled materials. The products and processes established during the project will be evaluated by the techno-economic and sustainability analysis.

Resultaat

COMPOCYCLE will increase resource efficiency by enabling recycling of products which are now impossible to recycle. This will reduce the dependency of virgin resources usage but also enable the transition to abundantly available biobased raw materials as a feedstock source. Overall, this strategy will contribute to the reduction of greenhouse gasses (GHG) emissions in two-fold: in the raw materials sourcing phase and in the end-of-life phase, which will significantly improve the ecological footprint of composites for furniture and building industry. The 100% biobased resin will be efficiently upscaled within the next 3-5 year after the project is finished by a dedicated resin producer partner of COMPOCYCLE consortium. The end users from construction industry (windows, facades) will be able to use the resins consequently.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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