

CIRPOLE

Publieke samenvatting / Public summary

Aanleiding

The transition toward the use of non-fossil feedstocks for the production of eco-friendly biobased building blocks in the coatings and paints industries is driven by factors such as environmental concerns, regulatory pressures, consumer mandates, health and safety considerations, and resource scarcity. The growing market demands, stricter regulations, and a push for circular and/or biodegradable, sustainable coatings and paints have led a significant share of coatings and paint manufacturers to invest in circular and bio-based solutions, either with 100% or a significant bio-based content in their product formulations, replacing fossil-based compounds. The innovations in developing biobased and non-toxic chemicals are essential for formulations; the society and the market applications are expected to benefit from advancements in upgrading coatings and paint technologies. A sustainable value circles approach can effectively achieve this goal by fostering collaboration among renewable feedstock/substrate suppliers, chemical technology providers, polymer producers, end users, and other stakeholders.

Doelstelling

CIRPOLE is aiming to use bio-based intermediates that are commercially produced from renewable and non-fossil-based feedstocks to develop monomeric building blocks as alternatives to fossil-derived aromatic building blocks currently used in the production of polyester resins for coatings and paints and specialty applications. The innovations in designing such monomers include the creation of labile and degradable linkages that can be triggered

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on demand either by microorganisms or by the action of chemicals, for instance. The latter case favors recovering the chemical components that can be reused to produce the virgin polyester resins. This allows upgrading the technology in the coatings and paint industries to produce the polyester resins that are non-persistent to the environment and at the same time addresses the circularity of the products by the end of their life, thus achieving significant CO₂ emission savings.

Korte omschrijving

- The renewable substrate supplier, RE:CHEMISTRY by GF Biochemicals, will provide biobased levulinic acid and levulinic acid esters.
- Glycerol (GLY), and other key platform chemicals such as trimethylolethane (TME), trimethylolpropane (TMP), and pentaerythritol (PEL) will be purchased from commercial suppliers.
- WR will produce monomeric building blocks and polyester resins with 100% biobased content containing (bio)degradable linkages using levulinic acid and triols/tetrol (GLX, TME, TMP, and PEL), respectively, to validate their performance in targeted coatings and paint applications.
- Allnex will assess the polyester resins in the intended applications. Subsequently, Allnex will be provided the new monomeric building blocks to produce polyester resins in their facilities, validating the new monomers' potential to produce polyester resins under industrial settings.
- VLCI will optimize the coating performance via predictive compatibility parameters-Hansen Solubility Parameters (HSP). BDS will evaluate the toxicity of newly developed ketal monomers in-vitro bioassays.
- End users will be identified and involved in the stakeholder meetings.

Resultaat

The design and synthesis of biobased monomeric building blocks will be established in CIRPOLE using substrates that were entirely derived from non-fossil-based feedstocks, such as agricultural waste streams or byproducts from other sectors like paper mills and/or the manufacturing of biodiesel. The inclusion of (bio)degradable linkages and non-toxicity are the key features of the monomers' safe-

by-design, which improves the significance of the production of biobased and circular polyesters on the commercial scale. Significant CO2 emissions, hazardous chemical components in the formulations, and the creation of linear products are the consequences associated with the traditional use of aromatic base chemicals produced from fossil fuels for such applications. CIRPOLE addresses these concerns in the development of eco-friendly and biobased monomeric building blocks in the formulations and in the production of circular products that significantly minimise the CO2 emissions. This way, economically, environmentally (including safety), and socially acceptable pathways for the production of sustainable products for the future are developed.

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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