Programme Safe and Circular Biobased products

Programme Outline Circular Biobased Products Symposium, June 22, 2023

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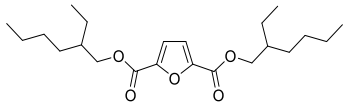
Programme Safe and circular biobased products

- In addition to replacing fossil feedstock based products by renewable alternatives, a future society requires these products to be *safe and circular by design* as well.
- The safe and circular biobased products programme focuses on:
  - Products that are composed of *complex formulations* that cannot be mechanically or chemically recycled and thus need to be redesigned to become recyclable and/ or biodegradable
  - Replacing intentionally added substances of very high concern (SVHC) and prevent formation of undesired non-intentionally added substances (NIAS) during (re)processing of products
  - Supporting these developments by supplying advice on sustainability and circular economy strategies and policies

Safe and sustainable substitutes for SVHC

- Society and industry require safe alternatives for substances of very high concern (“SVHC”); e.g. brominated flame retardants, phthalate plasticisers, solvents, perfluoroalkylsubstances (PFAS), antimicrobial agents, UV stabilisers. Some bulk chemicals like phenol and isocyanates are also known as SVCH.
- Together with industry we develop alternative biobased chemicals for SVHC that can be produced sustainably from biomass and are safe by design.



- Early phase toxicity screening is an integral part of product development

Safe and sustainable substitutes for SVHC

- Example Photonic pigment project: replacement of TiO2
- Rationale:
- Worldwide production is 6-8 million tonnes/year
- Current manufacturing process emits a lot of CO_2 up to >10 kg CO_2 /kg TiO_2
- Increasing concerns on potential carcinogenic effects of specific TiO_2 pigment grades

Topsector Agri& Food

SHERWIN-WILLIAMS.

SEPPIC

ADM

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forbo FLOORING SYSTEMS

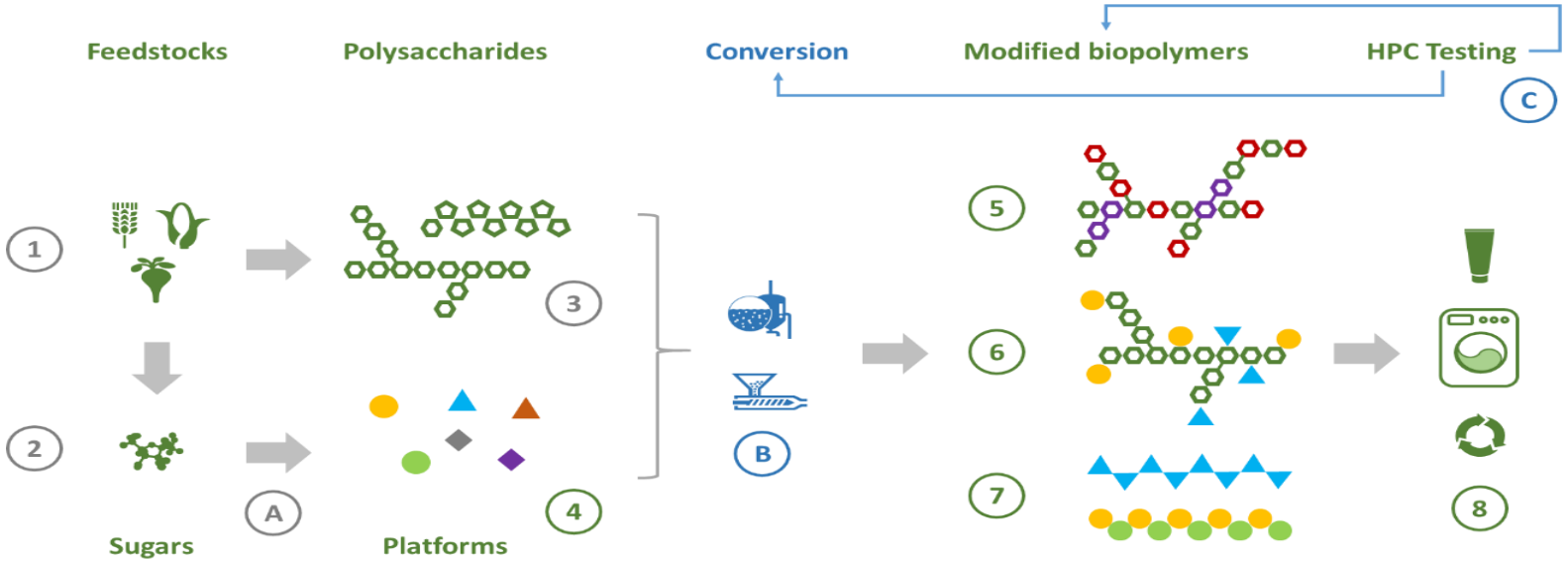
Biodegradable alternatives for products that end up in sewage water

- Products like home and personal care formulations cannot be recycled and inherently end up in the environment or at watertreatment plants; alternative products therefore should be designed to be safe, biobased and biodegradable

- Technology is under development that will enable to make all components, including surfactants, reology modifiers, softeners, chelating agents, fragrances, UV-absorbers, solvents to be biobased and biodegradable.
- Experimental synthetic research is being backed up by early phase toxicity screening and predictive modelling tools for functionality and biodegradability

CHARM Project

- The public-private project CHARM (Circular home and personal care reology modifiers) develops fossil free biodegradable reology modifiers based upon polysaccharides



Circular design of coatings and composites

- Coatings, adhesives and composites are often based on fossil raw materials and designed with durability in mind. Recycling is frequently no option as they consist of strong, cross-linked structures or are attached in thin layers upon other materials
- Our vision is to make these materials fully renewable and biodegradable, closing the loop at the end of their lifecycle.
- Various biobased technologies are being developed that enable a circular end-of-life scenario, without compromising the performance of these products.
- New biobased resins with reversible bonds enabling chemical or enzymatic hydrolysis or moieties that improve the biodegradability of products are key to our success

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Towards safe and circular (food) packaging materials

- To achieve full circularity all packages need to be reused and/or recycled maximally. Packages, however, pick-up contaminants along the value chain. The balance between the accumulation rate and the cleaning rate for the various contaminants determines the safety of the reused object and recycled material.

- In-depth knowledge on the origin of these contaminants and their removal is vital to keep circular systems safe. The focus of our attention is on compounds of high concern and non-intentionally added substances (NIAS).
- We study new sorting and recycling technologies that prevent the formation of contaminants or enable their removal. New recycling technologies include enzymatical depolymerisation pathways and related back-to-monomer depolymerization routes.

Some industrial cooperation partners

Thank you for your attention!

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